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KEY OF SOLUTIONS
TO EATON'S
COMMON SCHOOL ARITHMETIC



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6 A

KEY OF SOLUTIONS

TO EXAMPLES IN

[J. S.] EATON'S

COMMON SCHOOL ARITHMETIC.

BY

JAMES H. EATON, Ph. D.,

PROFESSOR IN BELOIT COLLEGE.



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PREFACE.

It was not the intention of the author to publish a book of solutions to the "Common School Arithmetic;" but the requests for manuscript solutions have been so numerous and frequent that it has been thought best to answer that demand, by the publication of a Key to that Arithmetic.

In graded schools there is little or no necessity for such a work; but in mixed schools, where the classes are very numerous, it is not always possible for teachers to make that careful preparation for each recitation that is desirable.

This Key is designed, therefore, for those teachers who are called to teach the Arithmetic without having studied it as a text-book, and either have not time to work out all the examples, or are not certain that they have obtained the best solutions.

There are various methods of solving many of the examples.

In every case much care has been exercised to adopt a good, clear, sensible solution; and, in many cases, two or three methods have been given, each having some advantages over the others, or one being adapted to one class of minds, and another to another class.

In some of the examples, for the sake of brevity, the numbers are considered as *abstract* until the work is done, and then the result is *denominated* as the examples require.

In many of the examples, where cancelling may be performed, the numbers have been arranged so as to show their relations, and the *cancelling* has not been performed, since it would be easier for any one to cancel than to trace the process of cancelling performed by another.

In examples where the cancelling is performed in the Key, the numbers given in the example are connected by the proper signs, but the numbers obtained in the process of cancelling have no signs connecting them.

It has not been thought best to solve all of the examples, such, e. g., as the greater part of those in the Simple Rules, many of those in Fractions, Compound Numbers, Interest, Extracting of Roots, etc.

Of this class, if the answers are given in the Arithmetic, they are omitted in the Key; if otherwise, they are inserted.

Most of the examples in Interest, after note 1, p. 191 of the Arithmetic, are solved in accordance with that note.

Examples to which the above remarks do not apply will be readily understood by the teacher.

A
KEY OF SOLUTIONS

TO
THE COMMON SCHOOL ARITHMETIC.

NOTATION.

4.	(ART. 24, p. 12. French Method.)	5,300
5.		6,100
6.		20,300,000
7.		900,060,013
4.	(ART. 25.)	365
5.		651
7.		42,554
8.		816,200
10.		306,502
11.		946,514,925
13.		5,651,406
14.		74,000,000
15.		63,014,700
3.	(ART. 32. English Method.)	200,610,275
2.	(ART. 33.)	517,322,114,841,969
3.		210,000,000,006,000

3. (ART. 36. Roman Method.)	XXIX
4.	XCIX
5.	CCLXXXIV
6.	MCCCCXLVI
7.	MDCXLIV
8.	Variable.

ADDITION.

11. (p. 18.)	8,999	50.	22,395
12.	9,988	52.	43,758,518
13.	89,789	53.	27,332,145
14.	7,898	56.	64,230sq.m.
16.	6,797	57.	2,728,116
24.	2,115	58.	\$18,827
25.	21,192	59.	\$572
26.	223,735	60.	\$2,452
27.	52,201	61.	1,393,338
28.	98,974	62.	6,018,717
29.	62,151	63.	184,909,588
30.	99,430	65.	\$84,571,886
32.	120,227	66.	\$6,506
33.	59,338	67.	582,741
34.	27,015	68.	1,319,725
37.	16,365	69.	948,278
38.	10,838	70.	768,449
39.	94,279	71.	365
41.	342,790	72.	33,648
42.	171,153	73.	27,420
43.	208,977	74.	\$10,108
45.	46,109	75.	446,633
46.	77,347	76.	\$31,762
48.	50,041		

SUBTRACTION.

11. (p. 25.)	4,112	45.	3,593
12.	3,201	46.	4,994
13.	5,310	48.	1,264
15.	302,204	50.	506,139
16.	2,264	51.	240
21.	2,487,852	52.	Variable.
23.	3,102,074	53.	915,949
24.	377,523	54.	6,128,523
25.	142	55.	29,230sq.m.
26.	916,008	56.	16,817,082bush.
27.	2,111,108	57.	\$2,450
29.	6,237	58.	408,663
30.	2,127	59.	354,577
31.	545,128	60.	560,246
33.	2,289	61.	67yrs.
34.	50,081	62.	\$3,134
36.	4,608,998	63.	\$2,586
37.	3,231,058	64.	94,760,000m.
39.	6,044,508	65.	902yrs.
41.	63,584	66.	\$1,276
43.	4,305		

ADDITION AND SUBTRACTION.

3. (p. 29.)	\$250	10.	291m.
5.	\$3	11.	599yrs.
6.	2,527	12.	\$10,075
7.	Maine, 5,770sq.m.		

MULTIPLICATION.

13. (p. 32.)	48,924	42.	14,645,612
14.	79,479	43.	16;003,352
15.	305,956	44.	14,835,296
17.	43,085,187	45.	64,421,850
21.	12,806,115,006	46.	851
22.	985,516,547	47.	\$1,591
23.	1,872,612	48.	697m.
24.	17,601,948	49.	899
25.	4,002,635	53.	194,152
26.	880,434	55.	566,568
28.	1,354,576	56.	38,059,956
29.	1,555,008	58.	517,197,024
30.	3,277,404	59.	48,385,638
36.	3,379,446	62.	4,698,000
37.	2,420,880	64.	59,874,000,000,000
38.	4,040,138	68.	63,139,910,400,000
39.	2,738,352	69.	4,639,527,515,000,000
40.	384,134	73.	4,377,317,000,000
41.	2,145,594	76.	293,343,530,562
77.			15,662,866,418,276,000,000
80.			4,269,573
82.			6,156 ; 4,788 ; and 5,472
84.			337,792 ; 3,260,992 ; and 3,273,984
86.			2,775,384 ; 1,404,824 ; and 2,090,104
88.			27,446,265 ; 137,094.265 ; and 1,027,984,265

MISCELLANEOUS EXAMPLES IN MULTIPLICATION.

3. (p. 40.)	4,725	8.	420
4.	3,600	9.	1,835,951,910,528
5.	68,400m.	10.	\$8,760
6.	691,200,000m.	11.	18,565,056
7.	6,000	12.	14,811,852

EXAMPLES IN THE FOREGOING PRINCIPLES. (p. 40.)

1.	817m.	10.	\$126
2.	7,336m.	11.	\$589
3.	Gained, \$96	16.	\$6,750
4.	\$4,343	17.	43m.
5.	\$216	18.	\$18,075
6.	Lost, \$16	19.	\$2,523
7.	\$32	20.	\$1,095

DIVISION. (p. 46.)

	Quotient.	Rem.		Quotient.	Rem.
32.	5,416		74.	75	
33.	7,432,966		75.	83	
34.	5,092,103		76.	19m.	
40.	52,954	3	80.	47	
41.	82,304	6	81.	757	
42.	30,411	2	82.	856	
44.	125		83.	345	
45.	456		84.	73	
46.	156		85.	19	
51.	192		86.	31	
60.	1,080	38	87.	41	
61.	2,052	394	88.	743	
62.	595	418	89.	6,541	
63.	1,001	265	90.	13	
64.	1,636	314	91.	17	
65.	12,654	2	92.	29	
66.	20,160	4,444	93.	13	
67.	99,891,686	2,955	94.	17	
69.	8,765a.		95.	23	
70.	\$500		103.	8,098	6
71.	23		104.	3,380	29
72.	24		105.	83	35
73.	73		106.	801	22

107.	2,637	22	117.	30	78,654,321
108.	139	31	119.	28	275
109.	223	24	121.	83	3,087
110.	89	10	123.	300	9,999
111.	57	12	124.	2,010	7,080
112.	75	43	125.	10,865	25,821
114.	40,276	3			

EXAMPLES IN THE FOREGOING PRINCIPLES. (p. 57.)

1.	42	11.	12
2.	24	13.	\$864
3.	\$1,280 and \$2	14.	\$348
5.	54,750	15.	5
8.	10	16.	7
9.	138		

REDUCTION.

(ART. 90, p. 60.)

(2.) 6£ 18s. 4d. 1qr.

$$\begin{array}{r}
 20 \\
 \hline
 138s. \\
 12 \\
 \hline
 276 \\
 138 \\
 4 \\
 \hline
 1660d. \\
 4 \\
 \hline
 6641qr., \text{ Ans.}
 \end{array}$$

NOTE. — The several numbers of the lower denominations may be added *mentally*, *writing only the results*, as, in this operation, is done with the 18s. and 1qr.; or, in some cases, it may be easier, and ∴ more convenient, to set the number *under* the partial product, and then add. as is here done with the 4d.

(3.) $7\text{£ } 9\text{s. } 3\text{qr.}$

$$\begin{array}{r}
 20 \\
 149\text{s.} \\
 12 \\
 \hline
 298 \\
 149 \\
 \hline
 1788\text{d.} \\
 4 \\
 \hline
 7155\text{qr., Ans.}
 \end{array}$$

(4.) $27\text{£ } 15\text{s. } 6\text{d. } 2\text{qr.}$

$$\begin{array}{r}
 20 \\
 555\text{s.} \\
 12 \\
 \hline
 6666\text{d.} \\
 4 \\
 \hline
 26666\text{qr., Ans.}
 \end{array}$$

(5.) $32\text{£ } 8\text{d. } 3\text{qr.}$

$$\begin{array}{r}
 20 \\
 640\text{s.} \\
 12 \\
 \hline
 7688\text{d.} \\
 4 \\
 \hline
 30755\text{qr., Ans.}
 \end{array}$$

(ART. 93, p. 61.)

(2.) $4)17229\text{qr.}$

$$\begin{array}{r}
 12)4307\text{d. } 1\text{qr.} \\
 20)358\text{s. } 11\text{d.} \\
 \hline
 17\text{£ } 18\text{s.}
 \end{array}$$

Ans. $17\text{£ } 18\text{s. } 11\text{d. } 1\text{qr.}$

(4.) $4)84697\text{qr.}$

$$\begin{array}{r}
 12)21174\text{d. } 1\text{qr.} \\
 20)1764\text{s. } 6\text{d.} \\
 \hline
 88\text{£ } 4\text{s.}
 \end{array}$$

Ans. $88\text{£ } 4\text{s. } 6\text{d. } 1\text{qr.}$

(6.) $4)347624\text{qr.}$

$$\begin{array}{r}
 12)86906\text{d.} \\
 20)7242\text{s. } 2\text{d.} \\
 \hline
 362\text{£ } 2\text{s.}
 \end{array}$$

Ans. $362\text{£ } 2\text{s. } 2\text{d.}$

(3.) $12)6874\text{d.}$

$$\begin{array}{r}
 20)572\text{s. } 10\text{d.} \\
 \hline
 28\text{£ } 12\text{s.}
 \end{array}$$

Ans. $28\text{£ } 12\text{s. } 10\text{d.}$

(5.) $4)124683\text{qr.}$

$$\begin{array}{r}
 12)31170\text{d. } 3\text{qr.} \\
 20)2597\text{s. } 6\text{d.} \\
 \hline
 129\text{£ } 17\text{s.}
 \end{array}$$

Ans. $129\text{£ } 17\text{s. } 6\text{d. } 3\text{qr.}$

(7.) $12)3746\text{d.}$

$$\begin{array}{r}
 20)312\text{s. } 2\text{d.} \\
 \hline
 15\text{£ } 12\text{s.}
 \end{array}$$

Ans. $15\text{£ } 12\text{s. } 2\text{d.}$

(8.) $20 \overline{)8793s.}$

Ans. 439£ 13s.

(ART. 94, p. 63.)

(3.) $16lb. 8oz. 19dwt.$

$$\begin{array}{r} 12 \\ \hline 200oz. \\ 20 \\ \hline 4019dwt. \\ 24 \\ \hline 16076 \\ 8038 \\ \hline \end{array}$$

96456gr., Ans.

(4.) $24 \overline{)38695gr.}$

$20 \overline{)1612dwt. 7gr.}$

$12 \overline{)80oz. 12dwt.}$

6lb. 8oz.

Ans. 6lb. 8oz. 12dwt. 7gr.

NOTE. — When the divisor is large, the work is done by Long Division, on the slate or elsewhere, only the result being written here.

(5.) $24 \overline{)87942gr.}$

$20 \overline{)3664dwt. 6gr.}$

$12 \overline{)183oz. 4dwt.}$

15lb. 3oz.

Ans. 15lb. 3oz. 4dwt. 6gr.

(6.) $15lb. 8oz. 6dwt. 15gr.$

$$\begin{array}{r} 12 \\ \hline 188oz. \\ 20 \\ \hline 3766dwt. \\ 24 \\ \hline 15064 \\ 7532 \\ \hline 15 \\ \hline 90399gr., \text{ Ans.} \end{array}$$

(7.) 2oz. 8dwt. 20 gr. $ \begin{array}{r} 20 \\ \hline 48\text{dwt.} \\ 24 \\ \hline 192 \\ 96 \\ \hline 20 \\ \hline 1172\text{gr., weight of 1 spoon.} \end{array} $	2lb. 5oz. 6dwt. $ \begin{array}{r} 12 \\ \hline 29\text{oz.} \\ 20 \\ \hline 586\text{dwt.} \\ 24 \\ \hline 2344 \\ \hline 1172 \end{array} $ 14064gr., total weight. $14064 \div 1172 = 12, \text{ Ans.}$
---	--

(8.) 3dwt. 16gr. $ \begin{array}{r} 24 \\ \hline 88\text{gr., weight of 1 ring.} \end{array} $	8oz. 16dwt. $ \begin{array}{r} 20 \\ \hline 176\text{dwt.} \\ 24 \\ \hline 704 \\ 352 \\ \hline 4224\text{gr., total weight.} \end{array} $
---	--

$4224 \div 88 = 48, \text{ Ans.}$

(ART. 95, p. 64.)

(3.) 6oz. 3dr. 1sc. 19gr. $ \begin{array}{r} 8 \\ \hline 51\text{dr.} \\ 3 \\ \hline 154\text{sc.} \\ 20 \\ \hline 3099\text{gr., Ans.} \end{array} $	(4.) 20)15984gr. $ \begin{array}{r} 3 \overline{)799}\text{sc. 4gr.} \\ 8 \overline{)266}\text{dr. 1sc.} \\ 12 \overline{)33}\text{oz. 2dr.} \\ \hline 2\text{lb. 9oz.} \end{array} $ Ans. 2lb. 9oz. 2dr. 1sc. 4 gr.
--	--

(5.) $20 \overline{)876943\text{gr.}}$

$3 \overline{)43847\text{sc. } 3\text{gr.}}$

$8 \overline{)14615\text{dr. } 2\text{sc.}}$

$12 \overline{)1826\text{oz. } 7\text{dr.}}$

$152\text{lb. } 2\text{oz.}$

Ans. 152lb. 2oz. 7dr. 2sc. 3gr.

(6.) $27\text{lb. } 8\text{oz. } 7\text{dr. } 2\text{sc. } 15\text{gr.}$

$\underline{12}$

332oz.

$\underline{8}$

2663dr.

$\underline{3}$

7991sc.

$\underline{20}$

159835gr., Ans.

(7.) 15gr.

$\underline{974}$

60

105

$\underline{135}$

$20 \overline{)14610\text{gr.}}$

$3 \overline{)730\text{sc. } 10\text{gr.}}$

$8 \overline{)243\text{dr. } 1\text{sc.}}$

$12 \overline{)30\text{oz. } 3\text{dr.}}$

$2\text{lb. } 6\text{oz.}$

Ans. 2lb. 6oz. 3dr. 1sc. 10gr.

(ART. 96, p. 65.)

(4.) $16 \overline{)3642897\text{dr.}}$

$16 \overline{)227681\text{oz. } 1\text{dr.}}$

$25 \overline{)142301\text{lb. } 1\text{oz.}}$

$4 \overline{)569\text{qr. } 5\text{lb.}}$

$20 \overline{)142\text{cwt. } 1\text{qr.}}$

$7\text{t. } 2\text{cwt.}$

Ans. 7t. 2cwt. 1qr. 5lb. 1oz. 1dr.

(3.) 3t. 6cwt. 2qr. 5lb. 6oz. 10dr.

$$\begin{array}{r}
 20 \\
 \hline
 66\text{cwt.} \\
 4 \\
 \hline
 266\text{qr.} \\
 25 \\
 \hline
 1330 \\
 532 \\
 5 \\
 \hline
 6655\text{lb.} \\
 16 \\
 \hline
 39930 \\
 6655 \\
 6 \\
 \hline
 106486\text{oz.} \\
 16 \\
 \hline
 638916 \\
 106486 \\
 10 \\
 \hline
 1703786\text{dr., Ans.}
 \end{array}$$

(5.) 37t. 19cwt. 3qr.

$$\begin{array}{r}
 20 \\
 \hline
 759\text{cwt.} \\
 4 \\
 \hline
 3039\text{qr.} \\
 25 \\
 \hline
 15195 \\
 6078 \\
 \hline
 75975\text{lb., Ans.}
 \end{array}$$

(6.) 25)17796lb.

$$\begin{array}{r}
 4)711\text{qr. 21lb.} \\
 20)177\text{cwt. 3qr.} \\
 \hline
 8\text{t. 17cwt.}
 \end{array}$$

Ans. 8t. 17cwt. 3qr. 21lb.

(8.) 16)1742684dr.

$$\begin{array}{r}
 16)108917\text{oz. 12dr.} \\
 25)6807\text{lb. 5oz.} \\
 4)272\text{qr. 7lb.} \\
 20)68\text{cwt.}
 \end{array}$$

3t. 8cwt.

Ans. 3t. 8cwt. 7lb. 5oz. 12dr.

(7.) 3t. 19cwt. 3qr. 24lb. 15oz. 15dr.

$$\begin{array}{r}
 20 \\
 \hline
 79\text{cwt.} \\
 4 \\
 \hline
 319\text{qr.} \\
 25 \\
 \hline
 1595 \\
 638 \\
 24 \\
 \hline
 7999\text{lb.} \\
 16 \\
 \hline
 47994 \\
 7999 \\
 15 \\
 \hline
 127999\text{oz.} \\
 16 \\
 \hline
 767994 \\
 127999 \\
 15 \\
 \hline
 2047999\text{dr., Ans.}
 \end{array}$$

(9.) 10t. 1cwt. 2qr. 10lb.

$$\begin{array}{r}
 20 \\
 \hline
 201\text{cwt.} \\
 4 \\
 \hline
 806\text{qr.} \\
 25 \\
 \hline
 4030 \\
 1612 \\
 10 \\
 \hline
 20160\text{lb.}
 \end{array}$$

$$20160 \div 2240 = 9, \text{ Ans.}$$

(10.) 22lb.

$$\begin{array}{r}
 365 \\
 \hline
 110 \\
 132 \\
 66 \\
 \hline
 25)8030\text{lb.} \\
 4)321\text{qr. 5lb.} \\
 20)80\text{cwt. 1qr.} \\
 4\text{t.}
 \end{array}$$

Ans. 4t. 1qr. 5lb.

(11.) 23lb. 8oz.

$$\begin{array}{r}
 16 \\
 \hline
 138 \\
 23 \\
 8 \\
 \hline
 376\text{oz.} \\
 313 \\
 \hline
 1128 \\
 376 \\
 \hline
 1128 \\
 16)117688\text{oz.} \\
 25)7355\text{lb. 8oz.} \\
 4)294\text{qr. 5lb.} \\
 20)73\text{cwt. 2qr.} \\
 3\text{t. 13cwt.}
 \end{array}$$

Ans. 3t. 13cwt. 2qr. 5lb. 8oz.

(ART. 97, p. 66.)

$$\begin{array}{r}
 (3.) \quad 27\text{yd. } 2\text{qr. } 3\text{na.} \\
 \underline{4} \\
 110\text{qr.} \\
 \underline{4} \\
 443\text{na.}, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (4.) \quad 4)873\text{na.} \\
 \underline{4)218\text{qr. } 1\text{na.}} \\
 54\text{yd. } 2\text{qr.} \\
 \text{Ans. } 54\text{yd. } 2\text{qr. } 1\text{na.}
 \end{array}$$

$$\begin{array}{r}
 (5.) \quad 167\text{yd. } 3\text{qr.} \\
 \underline{4} \\
 671\text{qr.} \\
 15\text{yd. } 1\text{qr.} \\
 \underline{4} \\
 61\text{qr.} \\
 671 \div 61 = 11, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (6.) \quad 2\text{yd. } 3\text{qr.} \\
 \underline{4} \\
 11\text{qr.} \\
 \underline{5} \\
 4)55\text{qr.} \\
 13\text{yd. } 3\text{qr.} \\
 \text{Ans. } 13\text{yd. } 3\text{qr.}
 \end{array}$$

$$\begin{array}{r}
 (7.) \quad 43\text{yd. } 2\text{qr. } 3\text{na.} \\
 \underline{4} \\
 174\text{qr.} \\
 \underline{4} \\
 699\text{na.}, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (8.) \quad 2\text{yd. } 1\text{qr.} \\
 \underline{4} \\
 9\text{qr.} \\
 \underline{8} \\
 4)72\text{qr.} \\
 18\text{yd.}, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (9.) \quad 25\text{yd. } 3\text{qr.} \\
 \underline{4} \\
 103\text{qr.} \\
 \underline{2} \\
 \$206, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (10.) \quad 4)7824\text{na.} \\
 4)1956\text{qr.} \\
 489\text{yd.}, \text{ Ans.}
 \end{array}$$

(ART. 98, p. 67.)

(3.) 4yd. 2ft. 8in.

$$\begin{array}{r} 3 \\ \hline 14\text{ft.} \\ 12 \\ \hline 176\text{in.} \\ 3 \end{array}$$

528b.c., Ans.

(4.) 3)473b.c.

12)157in. 2b.c.

3)13ft. 1in.

4yd. 1ft.

Ans. 4yd. 1ft. 1in. 2b.c.

(6.) 40)8000000rd.

8)200000fur.

25000m., Ans.

(5.) 7912m.

$$\begin{array}{r} 8 \\ \hline 63296\text{fur.} \end{array}$$

40

2531840rd., Ans.

(ART. 99, p. 69.)

(5.) 17m. 3fur. 5ch. 2rd. 24li.

8

(3.) 6fur. 2ch. 3rd. 18li.

$$\begin{array}{r} 10 \\ \hline 62\text{ch.} \\ 4 \end{array}$$

251rd.

25

1255

502

18

6293li., Ans.

139fur.

10

1395ch.

4

5582rd.

25

27910

11164

24

139574li., Ans.

(4.) 25)3879li.

4)155rd. 4li.

10)38ch. 3rd.

3fur. 8ch.

Ans. 3fur. 8ch. 3rd. 4li.

(6.) 25)13475li.

4)539rd.

10)134ch. 3rd.

8)13fur. 4ch.

1m. 5fur.

Ans. 1m. 5fur. 4ch. 3rd.

$$\begin{array}{r}
 (7.) \quad 23\text{m.} \\
 \quad \quad 8 \\
 \hline
 \quad 184\text{fur.} \\
 \quad \quad 10 \\
 \hline
 \quad 1840\text{ch.} \\
 \quad \quad 4 \\
 \hline
 \quad 7360\text{rd.} \\
 \quad \quad 25 \\
 \hline
 \quad 36800 \\
 \hline
 \quad 14720 \\
 \hline
 184000\text{li., Ans.}
 \end{array}$$

$$\begin{array}{r}
 (8.) \quad 25)400000\text{li.} \\
 \quad \quad 4)16000\text{rd.} \\
 \quad \quad 10)4000\text{ch.} \\
 \quad \quad 8)400\text{fur.} \\
 \hline
 \quad \quad \quad 50\text{m., Ans.}
 \end{array}$$

$$\begin{array}{r}
 (9.) \quad 7\text{fur. 6ch. 3rd.} \\
 \quad \quad 10 \\
 \hline
 \quad \quad 76\text{ch.} \\
 \quad \quad 4 \\
 \hline
 \quad \quad 307\text{rd.} \\
 \hline
 \$2 \times 307 = \$614, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (10.) \quad 25)637482\text{li.} \\
 \quad \quad 4)25499\text{rd. 7li.} \\
 \quad \quad 10)6374\text{ch. 3rd.} \\
 \quad \quad 8)637\text{fur. 4ch.} \\
 \hline
 \quad \quad 79\text{m. 5fur.} \\
 \hline
 \text{Ans. 79m. 5fur. 4ch. 3rd. 7li.}
 \end{array}$$

(ART. 100, p. 70.)

$$\begin{array}{r}
 (3.) \quad 14\text{sq.m. 25a. 3r. 30sq.rd.} \\
 \quad \quad 640 \\
 \hline
 \quad \quad 560 \\
 \hline
 \quad \quad 84 \\
 \hline
 \quad \quad 25 \\
 \hline
 \quad \quad 8985\text{a.} \\
 \quad \quad 4 \\
 \hline
 \quad \quad 35943\text{r.} \\
 \hline
 \quad \quad 40 \\
 \hline
 1437750\text{sq.rd., Ans.}
 \end{array}$$

$$\begin{array}{r}
 (4.) \quad 40)624873\text{sq.rd.} \\
 \quad \quad 4)15621\text{r. 33sq.rd.} \\
 \hline
 \quad \quad 640)3905\text{a. 1r.} \\
 \hline
 \quad \quad \quad 6\text{sq.m. 65a.} \\
 \hline
 \text{Ans. 6sq.m. 65a. 1r. 33sq.rd.} \\
 (5.) \quad 3\text{a. 2r. 25sq.rd.} \\
 \quad \quad 4 \\
 \hline
 \quad \quad 14\text{r.} \\
 \quad \quad 40 \\
 \hline
 \quad \quad 585\text{sq.rd.} \\
 \hline
 \$2 \times 585 = \$1170, \text{ Ans.}
 \end{array}$$

(ART. 102, p. 71.)

- (8.) $12 \overline{)36\text{sq.ft.}}$
3ft., Ans.
- (6.) $7 \times 9 = 63\text{sq.rd., Ans.}$
- (9.) $12 \overline{)300\text{sq.ft.}}$
25ft., Ans.
- (7.) $\begin{array}{r} 25 \\ 48 \\ \hline 200 \\ 100 \\ \hline \end{array}$
- (10.) $\begin{array}{r} 56 \\ 20 \\ \hline \end{array}$
- $40 \overline{)1200\text{sq.rd., 1st Ans.}}$ $40 \overline{)1120\text{sq.rd.}}$
 $4 \overline{)30\text{r.}}$ $4 \overline{)28\text{r.}}$
 7a. 2rd., 2d Ans. 7a., Ans.

(ART. 103, p. 72.)

- (3.) $\begin{array}{r} 3\text{c. } 6\text{c.ft. } 15\text{cu.ft. } 156\text{c.in.} \\ 8 \\ \hline 30\text{c.ft.} \\ 16 \\ \hline 180 \\ 30 \\ \hline 15 \\ \hline 495\text{cu.ft.} \\ 1728 \\ \hline 3960 \\ 990 \\ \hline 3465 \\ 495 \\ \hline 156 \\ \hline 855516\text{c. in., Ans.} \end{array}$
- (4.) $1728 \overline{)389664\text{c.in.}}$
 $40 \overline{)225\text{cu.ft. } 864\text{c.in.}}$
 5t. 25cu.ft.
 Ans. 5t. 25cu.ft. 864c.in.

(ART. 105, p. 73.)

- (6.) $18 \times 15 \times 9 = 2430$, Ans.
 (7.) $8 \times 4 = 32$; $96 \div 32 = 3$, Ans.
 (8.) $3 \times 2 = 6$; $24 \div 6 = 4$, Ans.
 (9.) $12 \times 5 = 60$; $480 \div 60 = 8$, Ans.
 (10.) $16 \times 4 \times 6 = 384$; $384 \div 128 = 3$, Ans.
 (11.) $8 \times 4 = 32$; $128 \div 32 = 4$, Ans.
 (12.) $15 \times 12 \times 9 = 1620$; $1620 \times 2 = 3240$, Ans.

(ART. 106, p. 74.)

- (3.) 8gal. 2qt. 1pt. 3gi.

$$\begin{array}{r} 4 \\ 34\text{qt.} \\ \cdot 2 \\ 69\text{pt.} \\ 4 \end{array}$$

279gi., Ans.

- (4.) 4)7496gi.

2)1874pt.

4)937qt.

234gal. 1 qt., Ans.

- (6.) 2gal. 3qt. 1pt.

$$\begin{array}{r} 4 \\ 11\text{qt.} \\ 2 \\ 23\text{pt.} \\ 24 \\ 92 \\ 46 \end{array}$$

2)552pt.

4)276qt.

69gal., Ans.

- (5.) 2gal. 1qt. 1 pt. 3gi.

$$\begin{array}{r} 4 \\ 9\text{qt.} \end{array}$$

2

19pt.

4

79gi

98gal. 3qt.

4

395qt.

2

790pt.

4

3160gi.

$3160 \div 79 = 40$, Ans.

(ART. 107, p. 75.)

(3.) 8bush. 2pk. 3qt. 1pt.

$$\begin{array}{r}
 4 \\
 \hline
 34\text{pk.} \\
 8 \\
 \hline
 275\text{qt.} \\
 2 \\
 \hline
 551\text{pt., Ans.}
 \end{array}$$

(5.) 2)4698pt.

$$\begin{array}{r}
 8)2349\text{qt.} \\
 4)293\text{pk. 5qt.} \\
 73\text{bush. 1pk.}
 \end{array}$$

Ans. 73bush. 1pk. 5qt.

(7.) 24bush. 1pk. 7qt. 1pt.

$$\begin{array}{r}
 4 \\
 \hline
 97\text{pk.} \\
 8 \\
 \hline
 783\text{qt.} \\
 2 \\
 \hline
 1567\text{pt., Ans.}
 \end{array}$$

(9.) 2)34569pt.

$$\begin{array}{r}
 8)17284\text{qt. 1pt.} \\
 4)2160\text{pk. 4qt.} \\
 540\text{bush.}
 \end{array}$$

Ans. 540bush. 4qt. 1pt.

(4.) 2)7893pt.

$$\begin{array}{r}
 8)3946\text{qt. 1pt.} \\
 4)493\text{pk. 2qt.} \\
 123\text{bush. 1pk.}
 \end{array}$$

Ans. 123bush. 1pk. 2qt. 1pt.

(6.) 15bush. 3pk. 6qt. 1pt.

$$\begin{array}{r}
 4 \\
 \hline
 63\text{pk.} \\
 8 \\
 \hline
 510\text{qt.} \\
 2 \\
 \hline
 1021\text{pt., Ans.}
 \end{array}$$

(8.) 3bush. 2pk.

$$\begin{array}{r}
 4 \\
 \hline
 14\text{pk.} \\
 1 \\
 \hline
 \$14, \text{ Ans.}
 \end{array}$$

(10.) 63bush. 2pk. 7qt. 1pt.

$$\begin{array}{r}
 4 \\
 \hline
 254\text{pk.} \\
 8 \\
 \hline
 2039\text{qt.} \\
 2 \\
 \hline
 4079\text{pt., Ans.}
 \end{array}$$

(ART. 108, p. 77.)

(3.) 1wk. 4d. 16h. 8m.

$$\begin{array}{r}
 7 \\
 \hline
 11d. \\
 24 \\
 \hline
 44 \\
 22 \\
 \hline
 16 \\
 280h. \\
 60 \\
 \hline
 16808m., \text{ Ans.}
 \end{array}$$

(6.) 60)342698m.

24)5711h. 38m.

7)237d. 23h.

4)33wk. 6d.

8l.m. 1wk.

Ans. 8l.m. 1wk. 6d. 23h. 38m.

(7.) 5c. 56yr. 8m.

$$\begin{array}{r}
 100 \\
 \hline
 556yr. \\
 12 \\
 \hline
 6680m., \text{ Ans.}
 \end{array}$$

(9.) 60)2419199sec.

60)40319m. 59sec.

24)671h. 59m.

7)27d. 23h.

3wk. 6d.

Ans. 3wk. 6d. 23h. 59m. 59sec.

(4.) 60)376487sec.

60)6274m. 47sec.

24)104h. 34m.

4d. 8h.

Ans. 4d. 8h. 34m. 47sec.

(5.) 365d. 5h. 48m. 50sec.

$$\begin{array}{r}
 24 \\
 \hline
 1460 \\
 730 \\
 5 \\
 \hline
 8765h. \\
 60 \\
 \hline
 525948m. \\
 60 \\
 \hline
 31556930sec., \text{ Ans.}
 \end{array}$$

(8.) 12)37846cal.m.

100)3153yr. 10cal.m.

31c. 53yr.

Ans. 31c. 53yr. 10cal.m.

(10.) 34d. 20h. 40m. 50sec.

$$\begin{array}{r}
 24 \\
 \hline
 136 \\
 68 \\
 20 \\
 \hline
 836h. \\
 60 \\
 \hline
 50200m. \\
 60 \\
 \hline
 3012050sec., \text{ Ans.}
 \end{array}$$

(ART. 109, p. 78.)

(3.) $9s. 20^{\circ} 55' 47''$

$$\begin{array}{r} 30 \\ 290^{\circ} \\ 60 \\ 17455' \\ 60 \end{array}$$

1047347'', Ans.

(4.) $60)7484925''$

$$\begin{array}{r} 60)124748' 45'' \\ 30)2079^{\circ} 8' \\ 12)69s. 9^{\circ} \end{array}$$

5circ. 9s.

Ans. 5circ. 9s. $9^{\circ} 8' 45''$.

(6.) $60)984627''$

$$\begin{array}{r} 60)16410' 27'' \\ 30)273^{\circ} 30' \\ 9s. 3^{\circ} \end{array}$$

Ans. 9s. $3^{\circ} 30' 27''$.

(5.) $3quad. 10^{\circ} 8' 5''$

$$\begin{array}{r} 90 \\ 280^{\circ} \\ 60 \\ 16808' \\ 60 \end{array}$$

1008485'', Ans.

(ART. 110, p. 79.)

(1.) 1qt. 1pt. 3gi.

$$\begin{array}{r} 2 \\ 3pt. \\ 4 \\ 15gi., 1bottle. \end{array}$$

61gal. 3qt. 1pt.

$$\begin{array}{r} 4 \\ 247qt. \\ 2 \\ 495pt. \\ 4 \end{array}$$

(2.) 3reams 18qu. 23sheets.

$$\begin{array}{r} 20 \\ 78qu. \\ 24 \\ 312 \\ 156 \\ 23 \end{array}$$

1895sheets, Ans.

1980gi., total.

15)1980

12)132, No. bottles.

11, No. doz., Ans.

MISCELLANEOUS EXAMPLES IN REDUCTION.

(p. 79.)

(1.) 27£ 14s. 6d. 3qr.

$$\begin{array}{r}
 20 \\
 \hline
 554s. \\
 12 \\
 \hline
 6654d. \\
 4 \\
 \hline
 \end{array}$$

26619qr., Ans.

(2.) 18bush. 3pk. 7qt. 1pt.

$$\begin{array}{r}
 4 \\
 \hline
 75pk. \\
 8 \\
 \hline
 607qt. \\
 2 \\
 \hline
 \end{array}$$

1215pt., Ans.

(3.) 7t. 14cwt. 2qr. 12lb. 8oz. 6dr.

$$\begin{array}{r}
 20 \\
 \hline
 154cwt. \\
 4 \\
 \hline
 618qr. \\
 25 \\
 \hline
 3090 \\
 1236 \\
 12 \\
 \hline
 15462lb. \\
 16 \\
 \hline
 92772 \\
 15462 \\
 8 \\
 \hline
 247400oz. \\
 16 \\
 \hline
 1484400 \\
 247400 \\
 6 \\
 \hline
 \end{array}$$

3958406dr., Ans.

(4.) 16)574692oz.

$$\begin{array}{r}
 25)35918lb. 4oz. \\
 4)1436qr. 18lb. \\
 20)359cwt. \\
 17t. 19cwt.
 \end{array}$$

Ans. 17t. 19cwt. 18lb. 4oz.

(5.) 60)1577048sec.

$$\begin{array}{r}
 60)26284m. 8sec. \\
 24)438h. 4m. \\
 7)18d. 6h. \\
 2wk. 4d.
 \end{array}$$

Ans. 2wk. 4d. 6h. 4m. 8sec.

(6.) 20) <u>24838</u>gr. 3) <u>1241</u>sc. 18gr. 8) <u>413</u>dr. 2sc. • 12) <u>51</u>oz. 5dr. 4lb. 3oz. Ans. 4lb. 3oz. 5dr. 2sc. 18gr.	(7.) 2circ. 4s. 20° 25' 30'' <u>12</u> 28s. <u>30</u> 860° <u>60</u> 51625' <u>60</u> 3097530'', Ans.
--	---

(8.) 3m. 5fur. 7ch. 2rd. 20li. <u>8</u> 29fur. <u>10</u> 297ch. <u>4</u> 1190rd. <u>25</u> 5950 2380 <u>20</u> 29770li., Ans.	(9.) 14lb. 7oz. 15dwt. 23gr. <u>12</u> 175oz. <u>20</u> 3515dwt. <u>24</u> 14060 7030 <u>23</u> 84383gr., Ans.	(10.) 6lb. 43 33 19 6gr. <u>12</u> 763 <u>8</u> 6113 <u>3</u> 18349 <u>20</u> 36686gr., Ans.
--	---	--

(11.) 144) <u>2548</u>sq.in. 9) <u>17</u>sq.ft. 100sq.in. 1sq.yd. 8sq.ft. Ans. 1sq.yd. 8sq.ft. 100sq.in.	(12.) 4) <u>411</u>na. 4) <u>102</u>qr. 3na. 25yd. 2qr. Ans. 25yd. 2qr. 2na.
---	---

(13.) $4)7432\text{qr.}$

$12)1858\text{d.}$

$20)154\text{s. } 10\text{d.}$

$7\text{£ } 14\text{s.}$

Ans. $7\text{£ } 14\text{s. } 10\text{d.}$

(14.) $16)18469874\text{dr.}$

$16)1154367\text{oz. } 2\text{dr.}$

$25)72147\text{lb. } 15\text{oz.}$

$4)2885\text{qr. } 22\text{lb.}$

$20)721\text{cwt. } 1\text{qr.}$

$36\text{t. } 1\text{cwt.}$

Ans. $36\text{t. } 1\text{cwt. } 1\text{qr. } 22\text{lb. } 15\text{oz. } 2\text{dr.}$

(15.) $24)54896\text{gr.}$

$20)2287\text{dwt. } 8\text{gr.}$

$12)114\text{oz. } 7\text{dwt.}$

$9\text{lb. } 6\text{oz.}$

Ans. $9\text{lb. } 6\text{oz. } 7\text{dwt. } 8\text{gr.}$

(16.) $4\text{sq.m. } 25\text{a. } 3\text{r. } 34\text{sq.rd.}$

640

2585a.

4

10343r.

40

$413754\text{sq.rd., Ans.}$

(17.) $8\text{c.yd. } 1727\text{c.in.}$

27

216cu.ft.

1728

1728

432

1512

216

1727

374975c.in., Ans.

(18.) 4sq.yd.

9

36sq.ft.

144

144

144

36

5184sq.in., Ans.

(19.) $4\text{gal. } 1\text{pt.}$

4

16qt.

2

33pt.

4

132gi., Ans.

(20.) $2\text{wk. } 6\text{d. } 8\text{h. } 16\text{sec.}$

7

20d.

24

488h.

60

29280m.

60

1756816sec., Ans.

(21.) $4\text{m. } 7\text{fur. } 39\text{rd.}$

8

39fur.

40

1599rd., Ans.

(22.) $40 \overline{)3795} \text{rd.}$

$\quad 8 \overline{)94} \text{fur. } 35 \text{rd.}$

$\quad \quad 11 \text{m. } 6 \text{fur.}$

$\text{Ans. } 11 \text{m. } 6 \text{fur. } 35 \text{rd.}$

(23.) $17 \text{yd. } 2 \text{qr. } 3 \text{na.}$

$\quad 4$

$\quad \quad 70 \text{qr.}$

$\quad 4$

$\text{Ans. } 283 \text{na., Ans.}$

(24.) $25 \overline{)10881} \text{li.}$

$\quad 4 \overline{)435} \text{rd. } 6 \text{li.}$

$\quad 10 \overline{)108} \text{ch. } 3 \text{rd.}$

$\quad \quad 8 \overline{)10} \text{fur. } 8 \text{ch.}$

$\quad \quad \quad 1 \text{m. } 2 \text{fur.}$

$\text{Ans. } 1 \text{m. } 2 \text{fur. } 8 \text{ch. } 3 \text{d. } 6 \text{li.}$

(25.) $2 \overline{)6598} \text{pt.}$

$\quad 8 \overline{)3299} \text{qt.}$

$\quad \quad 4 \overline{)412} \text{pk. } 3 \text{qt.}$

$\quad \quad \quad 103 \text{bush.}$

$\text{Ans. } 103 \text{bush. } 3 \text{qt.}$

(26.) $60 \overline{)4368294}''$

$\quad 60 \overline{)72804}' \quad 54''$

$\quad \quad 30 \overline{)1213}^\circ \quad 24'$

$\quad \quad \quad 12 \overline{)40} \text{s. } 13^\circ$

$\quad \quad \quad \quad 3 \text{circ. } 4 \text{s.}$

$\text{Ans. } 3 \text{circ. } 4 \text{s. } 13^\circ \quad 24' \quad 54''$

(27.) $4 \overline{)4680} \text{gi.}$

$\quad 2 \overline{)1170} \text{pt.}$

$\quad \quad 4 \overline{)585} \text{qt.}$

$\quad \quad \quad 146 \text{gal. } 1 \text{qt., Ans.}$

(29.) $40 \overline{)310556} \text{sq.rd.}$ (28.) $1728 \overline{)195261} \text{c.in.}$

$\quad 4 \overline{)7763} \text{r. } 36 \text{sq.rd.}$

$\quad 27 \overline{)112} \text{cu.ft. } 1725 \text{c.in.}$

$\quad 640 \overline{)1940} \text{a. } 3 \text{r.}$

$\quad \quad 4 \text{c.yd. } 4 \text{cu.ft.}$

$\quad \quad \quad 3 \text{sq.m. } 20 \text{a.}$

$\text{Ans. } 4 \text{c.yd. } 4 \text{cu.ft. } 1725 \text{c.in.}$

$\text{Ans. } 3 \text{sq.m. } 20 \text{a. } 3 \text{r. } 36 \text{sq.rd.}$

GENERAL PRINCIPLES.

(ART. 116, p. 83.)

$$\begin{array}{r}
 (5.) \quad 3 \overline{)3465} \\
 \quad 3 \overline{)1155} \\
 \quad \quad 5 \overline{)385} \\
 \quad \quad \quad 7 \overline{)77} \\
 \quad \quad \quad \quad 11
 \end{array}$$

Ans. 3, 3, 5, 7, 11.

$$\begin{array}{r}
 (6.) \quad 2 \overline{)19800} \\
 \quad 2 \overline{)9900} \\
 \quad \quad 2 \overline{)4950} \\
 \quad \quad \quad 3 \overline{)2475} \\
 \quad \quad \quad \quad 3 \overline{)825} \\
 \quad \quad \quad \quad \quad 5 \overline{)275} \\
 \quad \quad \quad \quad \quad \quad 5 \overline{)55} \\
 \quad \quad \quad \quad \quad \quad \quad 11
 \end{array}$$

Ans. 2, 2, 2, 2, 2, 3, 3, 5.

Ans. 2, 2, 2, 3, 3, 5, 5, 11.

$$\begin{array}{r}
 (7.) \quad 2 \overline{)1440} \\
 \quad 2 \overline{)720} \\
 \quad \quad 2 \overline{)360} \\
 \quad \quad \quad 2 \overline{)180} \\
 \quad \quad \quad \quad 2 \overline{)90} \\
 \quad \quad \quad \quad \quad 3 \overline{)45} \\
 \quad \quad \quad \quad \quad \quad 3 \overline{)15} \\
 \quad \quad \quad \quad \quad \quad \quad 5
 \end{array}$$

$$\begin{array}{r}
 (8.) \quad 2 \overline{)3150} \\
 \quad 3 \overline{)1575} \\
 \quad \quad 3 \overline{)525} \\
 \quad \quad \quad 5 \overline{)175} \\
 \quad \quad \quad \quad 5 \overline{)35} \\
 \quad \quad \quad \quad \quad 7
 \end{array}$$

Ans. 2, 3, 3, 5, 5, 7.

$$\begin{array}{r}
 (9.) \quad 2 \overline{)2310} \\
 \quad 3 \overline{)1155} \\
 \quad \quad 5 \overline{)385} \\
 \quad \quad \quad 7 \overline{)77} \\
 \quad \quad \quad \quad 11
 \end{array}$$

Ans. 2, 3, 5, 7, 11.

$$\begin{array}{r}
 (10.) \quad 2 \overline{)1728} \\
 \quad 2 \overline{)864} \\
 \quad \quad 2 \overline{)432} \\
 \quad \quad \quad 2 \overline{)216} \\
 \quad \quad \quad \quad 2 \overline{)108} \\
 \quad \quad \quad \quad \quad 2 \overline{)54} \\
 \quad \quad \quad \quad \quad \quad 3 \overline{)27} \\
 \quad \quad \quad \quad \quad \quad \quad 3 \overline{)9} \\
 \quad \quad \quad \quad \quad \quad \quad \quad 3
 \end{array}$$

Ans. 2, 2, 2, 2, 2, 2, 3, 3, 3.

$$\begin{array}{r}
 (11.) \quad 2 \overline{)1800} \\
 \quad \quad 2 \overline{)900} \\
 \quad \quad 2 \overline{)450} \\
 \quad \quad 3 \overline{)225} \\
 \quad \quad \quad 3 \overline{)75} \\
 \quad \quad \quad 5 \overline{)25} \\
 \quad \quad \quad \quad 5
 \end{array}$$

Ans. 2, 2, 2, 3, 3, 5, 5.

$$\begin{array}{r}
 (12.) \quad 2 \overline{)2448} \\
 \quad \quad 2 \overline{)1224} \\
 \quad \quad \quad 2 \overline{)612} \\
 \quad \quad \quad 2 \overline{)306} \\
 \quad \quad \quad 3 \overline{)153} \\
 \quad \quad \quad 3 \overline{)51} \\
 \quad \quad \quad \quad 17
 \end{array}$$

Ans. 2, 2, 2, 2, 3, 3, 17.

$$\begin{array}{r}
 (13.) \quad 2 \overline{)4824} \\
 \quad \quad 2 \overline{)2412} \\
 \quad \quad 2 \overline{)1206} \\
 \quad \quad 3 \overline{)603} \\
 \quad \quad 3 \overline{)201} \\
 \quad \quad \quad 67
 \end{array}$$

Ans. 2, 2, 2, 3, 3, 67.

$$\begin{array}{r}
 (14.) \quad 2 \overline{)3648} \\
 \quad \quad 2 \overline{)1824} \\
 \quad \quad \quad 2 \overline{)912} \\
 \quad \quad \quad 2 \overline{)456} \\
 \quad \quad \quad 2 \overline{)228} \\
 \quad \quad \quad 2 \overline{)114} \\
 \quad \quad \quad 3 \overline{)57} \\
 \quad \quad \quad \quad 19
 \end{array}$$

Ans. 2, 2, 2, 2, 2, 2, 3, 19.

$$\begin{array}{r}
 (15.) \quad 2 \overline{)8696} \\
 \quad \quad 2 \overline{)4348} \\
 \quad \quad 2 \overline{)2174} \\
 \quad \quad \quad 1087
 \end{array}$$

Ans. 2, 2, 2, 1087

$$\begin{array}{r}
 (16.) \quad 2 \overline{)7264} \\
 \quad \quad 2 \overline{)3632} \\
 \quad \quad 2 \overline{)1816} \\
 \quad \quad \quad 2 \overline{)908} \\
 \quad \quad \quad 2 \overline{)454}
 \end{array}$$

227

$$\begin{array}{r}
 (17.) \quad 5 \overline{)5075} \\
 \quad \quad 5 \overline{)1015} \\
 \quad \quad \quad 7 \overline{)203} \\
 \quad \quad \quad \quad 29
 \end{array}$$

Ans. 5, 5, 7, 29.

Ans. 2, 2, 2, 2, 2, 227.

GREATEST COMMON DIVISOR.

(ART. 120, p. 85.)

(4.)	$15 = 5 \times 3$	(5.)	$25 = 5 \times 5$
	$45 = 5 \times 3 \times 3$		$45 = 5 \times 3 \times 3$
	$75 = 5 \times 3 \times 5$		$70 = 5 \times 2 \times 7$
	$105 = 5 \times 3 \times 7$		
	$135 = 5 \times 3 \times 3 \times 3$		Ans. 5.
	$150 = 5 \times 3 \times 5 \times 2$		
	$300 = 5 \times 3 \times 5 \times 2 \times 2$		

Ans. $5 \times 3 = 15$.

(6.)	$24 = 2 \times 2 \times 2 \times 3$
	$36 = 2 \times 2 \times 3 \times 3$
	$64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$
	Ans. $2 \times 2 = 4$.

(7.)	$24 = 2 \times 2 \times 2 \times 3$
	$48 = 2 \times 2 \times 2 \times 2 \times 3$
	$72 = 2 \times 2 \times 2 \times 3 \times 3$
	$88 = 2 \times 2 \times 2 \times 11$

Ans. $2 \times 2 \times 2 = 8$.

(8.)	$45 = 5 \times 3 \times 3$
	$75 = 5 \times 3 \times 5$
	$90 = 5 \times 3 \times 3 \times 2$
	$135 = 5 \times 3 \times 3 \times 3$
	$150 = 5 \times 3 \times 5 \times 2$
	$180 = 5 \times 3 \times 3 \times 2 \times 2$

Ans. $5 \times 3 = 15$.

(9.) $11\text{ft. } 3\text{in.} = 135\text{in.} = 3 \times 3 \times 3 \times 5$
 $15\text{ft. } 9\text{in.} = 189\text{in.} = 3 \times 3 \times 3 \times 7$
 $18\text{ft.} = 216\text{in.} = 3 \times 3 \times 3 \times 2 \times 2 \times 2$
 $3 \times 3 \times 3 = 27, \quad 1\text{st Ans.}$
 $135 \div 27 = 5, \quad 2\text{d Ans.}$
 $189 \div 27 = 7, \quad 3\text{d Ans.}$
 $216 \div 27 = 8, \quad 4\text{th Ans.}$

(12.)

	Quotients.	
1430	$\times 2 =$	3549
1378	$= 2 \times$	2860
52	$\times 13 =$	689
52	$= 4 \times$	676
0		Ans. 13

NOTE. — The skillful teacher will abbreviate this operation, by *omitting the rule marks, and the column of quotients, carrying the quotients in his mind as he explains.* See the solution of Ex. 13.

(13.)

$$\begin{array}{r}
 3640 \\
 2093 \\
 \hline
 1547 \\
 1092 \\
 \hline
 455 \\
 455 \\
 \hline
 0
 \end{array}$$

5733

$$\begin{array}{r}
 3640 \\
 2093 \\
 \hline
 1547 \\
 546 \\
 \hline
 455 \\
 91, \text{ Ans.}
 \end{array}$$

(14.)

$$\begin{array}{r}
 1440 \\
 816 \\
 \hline
 624 \\
 576 \\
 \hline
 \text{Ans. } 48
 \end{array}$$

3696

$$\begin{array}{r}
 2880 \\
 816 \\
 \hline
 624 \\
 192 \\
 \hline
 192 \\
 0
 \end{array}$$

(15.)

$$\begin{array}{r}
 2520 \\
 2394 \\
 \hline
 126 \\
 126 \\
 \hline
 0
 \end{array}$$

6237

$$\begin{array}{r}
 5040 \\
 1197 \\
 \hline
 1134 \\
 63, \text{ Ans.}
 \end{array}$$

(17.) 84)96(1 <u>84</u> 12)84(7 <u>84</u> 0	12)144(12 <u>144</u> 0	12)174(14 <u>168</u> Ans. 6)12(2 <u>12</u> 0
(18.) 7		(20.) 1

LEAST COMMON MULTIPLE.

(ART. 127, p. 89.)

(3.) $22 = 11 \times 2$ $33 = 11 \times 3$ $55 = 11 \times 5$ Ans. $11 \times 5 \times 3 \times 2 = 330$	(4.) $16 = 2 \times 2 \times 2 \times 2$ $36 = 2 \times 2 \times 3 \times 3$ $40 = 2 \times 2 \times 2 \times 5$ $48 = 2 \times 2 \times 2 \times 2 \times 3$ Ans. $2^4 \times 3^2 \times 5 = 720$
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(5.) $20 = 2 \times 2 \times 5$ $30 = 2 \times 3 \times 5$ $50 = 2 \times 5 \times 5$ $80 = 2 \times 2 \times 2 \times 2 \times 5$ Ans. $2^4 \times 5^2 \times 3 = 1200$	(6.) 225 (7.) 3150 (8.) 576 (9.) 10080 (10.) 38808
---	--

(12.) $5)30, 40, 45, 75$

$3)6, 8, 9, 15$

$2)2, 8, 3, 5$

$1, 4, 3, 5$

Ans. $2 \times 5 \times 4 \times 3 \times 5 = 600$

Ans. $5 \times 3 \times 2 \times 4 \times 3 \times 5 = 1800$

(13.) $2)8, 30, 50$

$5)4, 15, 25$

$4, 3, 5$

(15.) $5)10, 15, 45, 75, 90$

$3)15, 18$

$5, 6$

(14.) $2)4, 5, 6, 8$

$2)2, 5, 3, 4$

$1, 5, 3, 2$

Ans. $5 \times 3 \times 5 \times 6 = 450$

Ans. $2 \times 2 \times 5 \times 3 \times 2 = 120$

(17.) $8 \times 9 \times 25 = 1800$, Ans.

(19.) $63 \times 72 \div 9 = 504$, Ans.

(20.) $33 \times 77 \div 11 = 231$, Ans.

FRACTIONS.

(ART. 139, p. 94.)

7.	$\frac{47}{8}$	11.	$\frac{115}{9}$	15.	$\frac{324}{20}$	19.	$\frac{146}{7}$
8.	$\frac{48}{5}$	12.	$\frac{95}{6}$	16.	$\frac{167}{9}$	20.	$\frac{613}{24}$
9.	$\frac{82}{7}$	13.	$\frac{139}{8}$	17.	$\frac{193}{10}$	21.	$\frac{299}{8}$
10.	$\frac{109}{8}$	14.	$\frac{175}{12}$	18.	$\frac{152}{9}$	22.	$\frac{835}{18}$

23.	$\frac{1407}{26}$	26.	$\frac{3393}{34}$	31.	$\frac{7569}{87}$	33.	$\frac{64}{4}$
24.	$\frac{2021}{24}$	28.	$\frac{72}{8}$	32.	$\frac{16}{1}$	34.	$\frac{80}{4}$
25.	$\frac{1661}{18}$	29.	$\frac{45}{5}$	35.	$\frac{14}{1}, \frac{28}{2}, \frac{42}{3}, \frac{56}{4}, \frac{70}{5}$		

(ART. 140, p. 95.)

6.	$5\frac{87}{154}$	9.	74
7.	1	10.	3
8.	$8\frac{11}{88}$	11.	72

(ART. 141, p. 96.)

5. 144)	$\frac{144}{1728} = \frac{1}{12}$, Ans.	11. 81)	$\frac{81}{243} = \frac{1}{3}$, Ans.
6. 48)	$\frac{96}{144} = \frac{2}{3}$, Ans.	12. 12)	$\frac{12}{288} = \frac{1}{24}$, Ans.
7. 9)	$\frac{72}{81} = \frac{8}{9}$, Ans.	13. 24)	$\frac{864}{984} = \frac{36}{41}$, Ans.
8. 4)	$\frac{844}{972} = \frac{211}{243}$, Ans.	14. 625)	$\frac{625}{3125} = \frac{1}{5}$, Ans.
9. 5)	$\frac{565}{875} = \frac{113}{175}$, Ans.	15. 4)	$\frac{896}{484} = \frac{224}{121}$, Ans.
10. 3)	$\frac{333}{696} = \frac{111}{232}$, Ans.		

(ART. 142, p. 97.)

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|---|--|
| <p>11. $\frac{28}{29}$</p> <p>12. $\frac{45}{53}$</p> <p>16. $\frac{33}{8} \times 6 \times 7 = 16\frac{1}{2}$, Ans.</p> <p>17. $\frac{73}{108} \times 7 \times 12 = 5\frac{1}{2}$, Ans.</p> <p>18. $\frac{155}{33} \times 4 \times 11 = 208$, Ans.</p> <p>20. 63</p> | <p>23. $\frac{5}{11} \times 12 = 5\frac{5}{11}$
 $9 \times 12 = 108$
 $108 + 5\frac{5}{11} = 113\frac{5}{11}$, Ans.</p> <p>24. $\frac{4}{5} \times 20 = 16$
 $18 \times 20 = 360$
 $360 + 16 = 376$, Ans.</p> <p>25. $23\frac{4}{7} = \frac{166}{7}$
 $\frac{166}{7} \times 7 = 166$, Ans.</p> |
|---|--|

(ART. 143, p. 99.)

18. $6)27\frac{3}{4}$
 Quo. $4....3\frac{3}{4}$ Rem.
 $3\frac{3}{4} = 2\frac{4}{4}$, and $2\frac{4}{4} \div 6 = \frac{4}{6}$
 $\therefore 4 + \frac{4}{6} = 4\frac{2}{3}$, Ans.
19. $9)17\frac{3}{5}$
 $1....8\frac{3}{5}$
 $8\frac{3}{5} = \frac{43}{5}$, and $\frac{43}{5} \div 9 = \frac{43}{45}$
 $\therefore 1 + \frac{43}{45} = 1\frac{43}{45}$, Ans.
4. $\frac{3}{5}$
5. $\frac{3}{3}$
6. $\frac{12}{253}$
10. $\frac{19}{264}$
11. $\frac{23}{8}$
14. $\frac{27}{5} \div (9 \times 2) = \frac{3}{70}$, Ans.
15. $\frac{35}{8} \div (7 \times 2) = \frac{5}{8}$, Ans.
20. $8)65\frac{4}{11}$
 $8....1\frac{4}{11}$
 $1\frac{4}{11} = \frac{15}{11}$, and $\frac{15}{11} \div 8 = \frac{15}{88}$
 $\therefore 8 + \frac{15}{88} = 8\frac{15}{88}$, Ans.
16. $\frac{624}{7} \div (4 \times 11) = \frac{156}{77} = 2\frac{2}{7}$, Ans.
22. $7\frac{3}{11} = \frac{80}{11}$; $\frac{80}{11} \div 9 = \frac{80}{99}$, Ans.
23. $5\frac{3}{4} = \frac{23}{4}$; $\frac{23}{4} \div 11 = \frac{23}{44}$, Ans.
24. $6\frac{3}{4} = \frac{27}{4}$; $\frac{27}{4} \div 9 = \frac{3}{4}$, Ans.

(ART. 144, p. 100.)

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|---|--|--|
| 5. $\frac{21}{185}$ | | 17. $\frac{2}{88} \times \frac{3}{231} = 6$, Ans. |
| 6. $\frac{114}{114}$ | | 18. $\frac{44}{88} \times \frac{1}{11} = \frac{1}{15}$, Ans. |
| 10. $\frac{25}{44} \times \frac{8}{11} = \frac{2}{33}$, Ans. | | 19. $\frac{3}{81} \times \frac{3}{27} = 9$, Ans. |
| 11. $\frac{24}{35} \times \frac{4}{84} = \frac{8}{35}$, Ans. | | 20. $\frac{25}{81} \times \frac{1}{27} = \frac{1}{9}$, Ans. |
| 12. $\frac{3}{33} \times \frac{1}{12} = \frac{1}{6}$, Ans. | | 21. $\frac{32}{125} \times \frac{1}{25} = \frac{1}{15}$, Ans. |
| 13. $\frac{3}{125} \times \frac{3}{84} = \frac{9}{35}$, Ans. | | |

$$25. \frac{8}{9} \times \frac{5}{7} \times \frac{11}{17} = \frac{440}{1071}, \text{ Ans.}$$

$$27. \frac{3}{8} \times \frac{4}{11} \times \frac{5}{11} \times \frac{1}{5} = \frac{3}{22}, \text{ Ans.}$$

$$28. \frac{5}{7} \times \frac{13}{17} \times \frac{17}{19} \times \frac{4}{8} = \frac{4}{7}, \text{ Ans.}$$

$$29. \frac{1}{3} \times \frac{4}{6} = \frac{1}{2}, \text{ Ans.}$$

$$30. \frac{\$}{\frac{\$}{3}} \text{ rd.} \times \frac{1}{\$} = \frac{1}{3} \text{ rd., Ans.}$$

$$31. \frac{\$}{8} \times \frac{3}{\$} = \frac{3}{8}, \text{ Ans.}$$

$$33. \frac{3}{24} \times \frac{5}{\$} = 15, \text{ Ans.}$$

$$34. \$45 \times \frac{3}{\$} = \$27, \text{ Ans.}$$

$$35. \$7 \times \frac{3}{4} = \$\frac{21}{4} = \$5\frac{1}{4}, \text{ Ans.}$$

$$37. \$1\frac{3}{5} \times 2\frac{3}{5} = \$\frac{8}{5} \times \frac{19}{\$} = \$\frac{19}{5} = \$3\frac{4}{5}, \text{ Ans.}$$

$$38. \$6\frac{1}{2} \times 1\frac{3}{4} = \$\frac{13}{2} \times \frac{7}{4} = \$\frac{91}{8} = \$11\frac{3}{8}, \text{ Ans.}$$

$$39. 6\frac{3}{8} \times 5\frac{3}{8} = \frac{17}{\$1} \times \frac{17}{\$} = \frac{289}{8} = 36\frac{1}{8} \text{ sq. rd., Ans.}$$

(ART. 145, p. 105.)

$$3. \frac{1}{2}\frac{8}{5} \qquad 21. \$\frac{21}{32} \div \frac{7}{8} = \$\frac{3}{4}, \text{ Ans.}$$

$$4. \frac{1}{9}\frac{4}{8} \qquad 22. \$\frac{6}{15} \div \frac{3}{5} = \$\frac{2}{3}, \text{ Ans.}$$

$$6. \frac{2}{16}\frac{1}{5} \qquad 23. \$\frac{9}{8} \div \frac{3}{4} = \$\frac{3}{2} = \$1\frac{1}{2}, \text{ Ans.}$$

$$8. \frac{3}{5} \times \frac{7}{9} \times \frac{5}{6} \div \frac{3}{8} \times \frac{4}{7} = \frac{\$}{\$} \times \frac{7}{9} \times \frac{\$}{\$} \times \frac{\frac{2}{\$}}{\frac{\$}{3}} \times$$

$$\frac{7}{4} = \frac{49}{27} = 1\frac{22}{27}, \text{ Ans.}$$

$$9. \quad \frac{5}{8} \times \frac{4}{9} \div \frac{4}{3} \times \frac{8}{9} \times \frac{5}{6} = \frac{\cancel{5}}{8} \times \frac{\cancel{4}}{\cancel{9}} \times \frac{3}{\cancel{4}} \times \frac{\cancel{8}}{\cancel{9}} \times \frac{5}{6}$$

$$\frac{3}{\cancel{6}} = \frac{9}{32}, \text{ Ans.}$$

$$10. \quad \frac{4}{8} \times \frac{3}{9} \times \frac{7}{6} \div \frac{7}{8} \times \frac{3}{4} = \frac{\cancel{4}}{\cancel{8}} \times \frac{\cancel{3}}{\cancel{9}} \times \frac{7}{\cancel{6}} \times \frac{\cancel{8}}{\cancel{7}} \times \frac{3}{4}$$

$$\frac{4}{\cancel{3}} = \frac{8}{27}, \text{ Ans.}$$

$$11. \quad \frac{24}{6} = 4, \text{ Ans.}$$

$$26. \quad 43\frac{3}{4}\text{c.} \div 3\frac{1}{2} = \frac{175}{4}\text{c.} \div \frac{7}{2} =$$

$$12. \quad \frac{36}{3} = 12, \text{ Ans.}$$

$$\frac{25}{2}\text{c.} = 12\frac{1}{2}\text{c.}, \text{ Ans.}$$

$$14. \quad \frac{18}{9} = 2, \text{ Ans.}$$

$$27. \quad 19\frac{1}{2}\text{m.} \div 5\frac{1}{2} = \frac{279}{14}\text{m.} \div \frac{36}{7} =$$

$$15. \quad \frac{84}{21} = 4, \text{ Ans.}$$

$$\frac{\overset{31}{\cancel{279}}}{\underset{2}{\cancel{14}}}\text{m.} \times \frac{7}{\underset{4}{\cancel{36}}} = \frac{31}{8} = 3\frac{7}{8}\text{m.}, \text{ Ans.}$$

$$16. \quad \frac{846}{423} = 2, \text{ Ans.}$$

$$28. \quad 19\frac{1}{2} \div 3\frac{1}{8} = \frac{279}{14} \div \frac{31}{8} =$$

$$18. \quad \frac{144}{1728} = \frac{1}{12}, \text{ Ans.} \quad \frac{\overset{9}{\cancel{279}}}{\underset{7}{\cancel{14}}} \times \frac{\overset{4}{\cancel{8}}}{\cancel{31}} = \frac{36}{7} = 5\frac{1}{7}, \text{ No. hours, Ans.}$$

$$20. \quad \frac{96}{1728} \div \frac{24}{144} = \frac{4}{12} = \frac{1}{3}, \text{ Ans.}$$

(ART. 146, p. 107.)

$$3. \quad \frac{4\frac{1}{5}}{6\frac{2}{10}} = \frac{2\frac{3}{5}}{6\frac{2}{10}} = \frac{23}{5} \div \frac{69}{10} = \frac{\cancel{23}}{\cancel{5}} \times \frac{\cancel{10}}{\cancel{69}} = \frac{2}{3}, \text{ Ans.}$$

- $$4. \frac{8\frac{4}{3}}{12\frac{2}{3}} = \frac{7\frac{6}{3}}{3\frac{2}{3}} = \frac{76}{9} \div \frac{38}{3} = \frac{7\cancel{6}}{\cancel{9}} \times \frac{\cancel{3}}{\cancel{38}} = \frac{2}{3}, \text{ Ans.}$$
- $$5. \frac{4\frac{3}{8}}{1\frac{3}{8}} = \frac{3\frac{5}{8}}{1\frac{1}{8}} = \frac{35}{8} \div \frac{11}{8} = \frac{35}{\cancel{8}} \times \frac{\cancel{8}}{11} = \frac{35}{11}, \text{ Ans.}$$
- $$6. \frac{3\frac{5}{4}}{6\frac{3}{4}} = \frac{2\frac{9}{4}}{2\frac{7}{4}} = \frac{29}{8} \div \frac{27}{4} = \frac{29}{\cancel{8}} \times \frac{\cancel{4}}{27} = \frac{29}{54}, \text{ Ans.}$$
- $$7. \frac{5\frac{3}{8}}{7\frac{5}{8}} = \frac{4\frac{3}{8}}{4\frac{7}{8}} = \frac{43}{8} \div \frac{47}{6} = \frac{43}{\cancel{8}} \times \frac{\cancel{6}}{47} = \frac{129}{188}, \text{ Ans.}$$
- $$8. \frac{5\frac{3}{5}}{\frac{2}{5}} = \frac{2\frac{8}{5}}{\frac{2}{5}} = \frac{28}{5} \div \frac{3}{5} = \frac{28}{\cancel{5}} \times \frac{\cancel{5}}{3} = \frac{28}{3}, \text{ Ans.}$$
- $$9. \frac{\frac{2}{5} \times \frac{3}{7} \times 2\frac{1}{3}}{3\frac{1}{5}} = \frac{\frac{2}{5} \times \frac{3}{7} \times \frac{7}{3}}{\frac{16}{5}} = \frac{2 \times \cancel{3} \times \cancel{7} \times \cancel{5}}{\cancel{5} \times \cancel{7} \times \cancel{3} \times 16} = \frac{2}{16}, \text{ Ans.}$$
- $$10. \frac{7\frac{2}{3}}{4\frac{4}{3}} = \frac{2\frac{2}{3}}{4\frac{0}{3}} = \frac{23}{3} \div \frac{40}{9} = \frac{23}{\cancel{3}} \times \frac{\cancel{9}}{40} = \frac{69}{40}, \text{ Ans.}$$
- $$11. \frac{18}{2\frac{1}{3}} = \frac{18}{\frac{7}{3}} = 18 \div \frac{7}{3} = \frac{18 \times 3}{7} = \frac{54}{7}, \text{ Ans.}$$
- $$13. \frac{\frac{3}{8}}{7} = \frac{3}{8 \times 7} = \frac{3}{56}, \text{ Ans.}$$
- $$15. \frac{\frac{3}{6} \times \frac{2}{6} \times \frac{7}{8} \times \frac{5}{4}}{\frac{14}{6} \times \frac{3}{16} \times \frac{1}{4} \times 2} = \frac{\cancel{3} \times \cancel{2} \times \cancel{7} \times \cancel{5} \times \cancel{6} \times \cancel{6} \times \overset{2}{10} \times \overset{1}{4}}{\cancel{6} \times \cancel{6} \times \cancel{6} \times \cancel{4} \times \cancel{14} \times \underset{2}{2} \times \cancel{3} \times \cancel{2}} = 1, \text{ Ans.}$$

(ART. 147, p. 109.)

6. $\frac{175}{4510}, \frac{120}{3510}, \frac{336}{3510}$. 7. $\frac{210}{462}, \frac{188}{462}, \frac{385}{462}$.
 8. $\frac{1638}{3510}, \frac{975}{3510}, \frac{1080}{3510}$. 9. $\frac{190}{855}, \frac{513}{855}, \frac{180}{855}$.
 10. $\frac{2576}{4048}, \frac{1268}{4048}, \frac{1408}{4048}$. 11. $\frac{585}{1170}, \frac{702}{1170}, \frac{910}{1170}, \frac{880}{1170}$.
 12. $\frac{693}{1848}, \frac{1320}{1848}, \frac{616}{1848}, \frac{1176}{1848}$. 13. $\frac{6732}{8415}, \frac{6120}{8415}, \frac{936}{8415}, \frac{7920}{8415}$.
 14. $\frac{63342}{527850}, \frac{78200}{527850}, \frac{77625}{527850}, \frac{206550}{527850}$.
 15. $\frac{61200}{89450}, \frac{23100}{89450}, \frac{7956}{89450}, \frac{27625}{89450}$. 18. $\frac{12}{80}, \frac{25}{80}, \frac{14}{80}, \frac{9}{80}$.
 19. $\frac{24}{80}, \frac{15}{80}, \frac{17}{80}, \frac{26}{80}$. 22. $\frac{20}{30}, \frac{24}{30}, \frac{10}{30}, \frac{15}{30}$.
 23. $\frac{15}{80}, \frac{26}{80}, \frac{10}{80}, \frac{28}{80}$. 24. $\frac{26}{80}, \frac{20}{80}, \frac{28}{80}, \frac{15}{80}$.
 26. $\frac{1}{3} \times \frac{8}{7} = \frac{8}{21}$; $2\frac{2}{3} = \frac{17}{7}$; $\frac{3\frac{1}{2}}{5\frac{1}{2}} = \frac{1\frac{3}{4}}{6\frac{1}{2}} = \frac{13}{4} \div \frac{65}{12} =$
 $\frac{3}{5}$; $\frac{8}{21}, \frac{17}{7}, \frac{3}{5}$, and $\frac{3}{10} = \frac{80}{210}, \frac{510}{210}, \frac{126}{210}$, and $\frac{63}{210}$, Ans.
 27. $\frac{\frac{7}{4}}{\frac{3}{4}} = \frac{7}{3} \div \frac{3}{4} = \frac{28}{9}$; $\frac{1}{3} \times \frac{5}{6} = \frac{5}{18}$; $\frac{28}{9}, \frac{5}{18}$, and
 $\frac{7}{24} = \frac{224}{72}, \frac{20}{72}$, and $\frac{21}{72}$, Ans.

(ART. 148, p. 112.)

6. $\frac{3 \times 12 \times 20 \times 24}{800 \ 40 \ 5} = \frac{108}{5}$ gr., Ans.
 7. $\frac{3 \times 12 \times 8 \times 3 \times 20}{800 \ 40 \ 5} = \frac{108}{5}$ gr., Ans.
 8. $\frac{1 \times 24 \times 60 \times 60}{4200 \ 70} = \frac{144}{7}$ sec., Ans.
 9. $\frac{2 \times 4 \times 8 \times 2}{15} = \frac{128}{15}$ pt., Ans.
 10. $\frac{5 \times 4 \times 2 \times 4}{12 \ 3} = \frac{40}{3}$ gi., Ans.

$$11. \frac{7 \times 27 \times 1728}{8640 \cdot 5} = \frac{189}{5} \text{ c. in., Ans.}$$

$$12. \frac{1 \times 30 \times 60 \times 60}{84 \cdot 7} = \frac{9000''}{7}, \text{ Ans.}$$

$$13. \frac{3 \times 640 \times 4 \times 40}{12400 \cdot 1060 \cdot 53} = \frac{384}{53} \text{ rd., Ans.}$$

$$14. \frac{3 \times 10 \times 4 \times 25}{2800 \cdot 112 \cdot 28 \cdot 14} = \frac{15}{14} \text{ li., Ans.}$$

$$15. \frac{4 \times 4 \times 40 \times 121}{363 \cdot 3 \cdot 4} = \frac{160}{3} \text{ sq.yd. Ans.}$$

$$16. \frac{3 \times 4 \times 4 \times 9}{28 \cdot 7 \cdot 4} = \frac{27}{7} \text{ in., Ans.}$$

$$17. \frac{1 \times 12 \times 30 \times 60 \times 60}{21 \cdot 7} = \frac{432000''}{7}, \text{ Ans.}$$

$$18. \frac{5 \times 20 \times 4 \times 25 \times 16}{48 \cdot 3} = \frac{10000}{3} \text{ oz., Ans.}$$

$$19. \frac{5 \times 24 \times 60 \times 60}{3024 \cdot 126 \cdot 21 \cdot 7} = \frac{1000}{7} \text{ sec., Ans.}$$

$$20. \frac{11 \times 20 \times 12 \times 4}{6720 \cdot 336 \cdot 28 \cdot 7} = \frac{11}{7} \text{ qr., Ans.}$$

$$21. \frac{5 \times 4 \times 8 \times 2}{72 \cdot 9} = \frac{40}{9} \text{ pt., Ans.}$$

(ART. 149, p. 113.)

$$6. \frac{168 \cdot 14 \cdot 7}{5 \times 20 \times 3 \times 8 \times 12} = \frac{7}{1200} \text{ lb., Ans.}$$

$$7. \frac{168 \cdot 7}{5 \times 24 \times 20 \times 12} = \frac{7}{1200} \text{ lb., Ans.}$$

$$8. \frac{25200 \quad 1050 \quad 35 \quad 7}{11 \times 60 \times 60 \times 24} = \frac{7}{264} \text{d., Ans.}$$

$\frac{1}{12} \quad \frac{1}{2}$

$$9. \frac{4 \times 4}{25 \times 9 \times 4 \times 4} = \frac{1}{225} \text{yd., Ans.}$$

$$10. \frac{108 \quad 7 \quad 1}{5 \times 60 \times 60 \times 24 \times 7} = \frac{1}{18000} \text{wk., Ans.}$$

$$11. \frac{432 \quad 3 \quad 1}{7 \times 144 \times 6} = \frac{1}{21} \text{sq.yd., Ans.}$$

$\frac{1}{3}$

$$12. \frac{450 \quad 18 \quad 6 \quad 3}{21 \times 25 \times 4 \times 10} = \frac{3}{140} \text{fur., Ans.}$$

$\frac{1}{7} \quad \frac{1}{2}$

$$13. \frac{363 \times 4}{13 \times 121 \times 40 \times 4} = \frac{3}{520} \text{a., Ans.}$$

$\frac{3}{1}$

$$14. \frac{720 \quad 12 \quad 1}{14 \times 60 \times 60 \times 30} = \frac{1}{2100} \text{s., Ans.}$$

$\frac{1}{5}$

$$15. \frac{16 \quad 4 \quad 1}{13 \times 4 \times 2 \times 4} = \frac{1}{26} \text{gal., Ans.}$$

(ART. 150, p. 114.)

$$3. \frac{2}{5} \text{a.} (= \frac{2}{5} \text{r.} \times 4) = \frac{8}{5} \text{r.} = 1\frac{3}{5} \text{r.}; \frac{1}{5} \text{r.} (= \frac{1}{5} \text{rd.} \times 40) = \frac{40}{5} \text{rd.} = 8 \text{rd.}; \frac{1}{5} \text{rd.} (= \frac{1}{5} \text{yd.} \times 30\frac{1}{4}) = \frac{30\frac{1}{4}}{5} \text{yd.} = 6\frac{1}{20} \text{yd.}; \frac{1}{5} \text{yd.} (= \frac{1}{5} \text{ft.} \times 9) = \frac{9}{5} \text{ft.} = 1\frac{4}{5} \text{ft.}; \frac{1}{5} \text{ft.} (= \frac{1}{5} \text{in.} \times 144) = \frac{144}{5} \text{in.} = 28\frac{4}{5} \text{in.}; \therefore 1 \text{r. } 8 \text{rd. } 6 \text{yd. } 1 \text{ft. } 28\frac{4}{5} \text{in., Ans.}$$

$$4. \frac{1}{5} \text{fur.} (= \frac{1}{5} \text{rd.} \times 40) = \frac{40}{5} \text{rd.} = 8 \text{rd.}; \frac{1}{5} \text{rd.} (= \frac{1}{5} \text{yd.} \times 5\frac{1}{2}) = \frac{5\frac{1}{2}}{5} \text{yd.} = 1\frac{1}{2} \text{yd.}; \frac{1}{5} \text{yd.} (= \frac{1}{5} \text{ft.} \times 3) = \frac{3}{5} \text{ft.} = 0\frac{3}{5} \text{ft.}; \therefore 8 \text{rd. } 1\frac{1}{2} \text{yd. } 0\frac{3}{5} \text{ft., Ans.}$$

NOTE.—To abbreviate the operations in the remaining examples in this article, *the multipliers will be carried in the mind*, only the results being written.

5. $\frac{3}{5}\text{wk.} = \frac{2}{5}\text{d.} = 4\frac{1}{5}\text{d.}; \frac{1}{5}\text{d.} = \frac{2}{5}\text{h.} = 4\frac{4}{5}\text{h.}; \frac{4}{5}\text{h.} = 48\text{m.}; \therefore 4\text{d. } 4\text{h. } 48\text{m., Ans.}$
6. $\frac{2}{3}\frac{3}{4}\text{rd.} = \frac{2}{3}\frac{2}{5}\text{yd.} = 5\frac{2}{3}\frac{1}{4}\text{yd.}; \frac{2}{3}\frac{1}{4}\text{yd.} = \frac{2}{3}\frac{1}{8}\text{ft.} = 1\frac{7}{8}\text{ft.}; \frac{7}{8}\text{ft.} = \frac{1}{3}\text{in.} = 4\frac{2}{3}\text{in.}; \frac{2}{3}\text{in.} = 2\text{b.c.}; \therefore 5\text{yd. } 1\text{ft. } 4\text{in. } 2\text{b.c., Ans.}$
7. $\frac{1}{2}\frac{1}{3}\frac{6}{8}\frac{7}{8}\text{circ.} = \frac{1}{18}\frac{6}{8}\frac{7}{8}\text{s.} = 6\frac{8}{18}\frac{7}{8}\text{s.}; \frac{8}{18}\frac{7}{8}\text{s.} = \frac{8}{6}\frac{7}{8}^\circ = 14\frac{4}{6}^\circ; \frac{4}{6}^\circ = 47'; \therefore 6\text{s. } 14^\circ 47', \text{Ans.}$
8. $\frac{7}{8}\text{t.} = \frac{3}{5}\text{cwt.} = 5\frac{3}{5}\text{cwt.}; \frac{3}{5}\text{cwt.} = \frac{1}{3}\text{qr.} = 3\frac{1}{3}\text{qr.}; \frac{1}{3}\text{qr.} = \frac{2}{3}\text{lb.} = 8\frac{1}{3}\text{lb.}; \frac{1}{3}\text{lb.} = \frac{1}{3}\text{oz.} = 5\frac{1}{3}\text{oz.}; \frac{1}{3}\text{oz.} = \frac{1}{3}\text{dr.} = 5\frac{1}{3}\text{dr.}; \therefore 5\text{cwt. } 3\text{ qr. } 8\text{lb. } 5\text{oz. } 5\frac{1}{3}\text{dr., Ans.}$
9. $\frac{1}{5}\frac{7}{8}\text{lb.} = \frac{1}{8}\frac{3}{8}\text{oz.} = 3\frac{7}{8}\text{oz.}; \frac{7}{8}\text{oz.} = \frac{2}{3}\text{dr.} = 4\frac{2}{3}\text{dr.}; \frac{2}{3}\text{dr.} = \frac{1}{2}\text{sc.} = 2\frac{1}{2}\text{sc.}; \frac{1}{2}\text{sc.} = 10\text{gr.}; \therefore 3\text{oz. } 4\text{dr. } 2\text{sc. } 10\text{gr., Ans.}$
10. $\frac{1}{10}\frac{3}{8}\frac{8}{8}\text{circ.} = \frac{2}{8}\frac{3}{8}\frac{8}{8}\text{s.} = 2\frac{5}{8}\frac{1}{8}\text{s.}; \frac{5}{8}\frac{1}{8}\text{s.} = \frac{2}{144}^\circ = 20\frac{2}{144}^\circ; \frac{2}{144}^\circ = \frac{1}{12}^\circ = 10\frac{5}{12}'; \frac{5}{12}' = 25''; \therefore 2\text{s. } 20^\circ 10' 25'', \text{Ans.}$
11. $\frac{1}{2}\text{c.yr.} = \frac{5}{2}\frac{1}{2}\text{d.} = 189\frac{1}{2}\text{d.}; \frac{1}{2}\text{d.} = \frac{5}{8}\text{h.} = 6\frac{3}{8}\text{h.}; \frac{3}{8}\text{h.} = \frac{4}{3}\text{m.} = 13\frac{1}{3}\text{m.}; \frac{1}{3}\text{m.} = 20\text{sec.}; \therefore 189\text{d. } 6\text{h. } 13\text{m. } 20\text{sec., Ans.}$
12. $\frac{7}{14}\frac{6}{8}\text{lb.} = \frac{7}{2}\frac{3}{8}\text{oz.} = 6\frac{4}{2}\frac{3}{8}\text{oz.}; \frac{4}{2}\frac{3}{8}\text{oz.} = \frac{4}{6}\text{dwt.} = 8\frac{1}{6}\text{dwt.}; \frac{1}{6}\text{dwt.} = 4\text{gr.}; \therefore 6\text{oz. } 8\text{dwt. } 4\text{gr., Ans.}$
13. $\frac{1}{2}\frac{2}{3}\text{bush.} = \frac{1}{3}\text{pk.} = 3\frac{1}{3}\text{pk.}; \frac{1}{3}\text{pk.} = \frac{4}{3}\text{qt.} = 1\frac{1}{3}\text{qt.}; \frac{1}{3}\text{qt.} = \frac{2}{3}\text{pt.}; \therefore 3\text{pk. } 1\text{qt. } \frac{2}{3}\text{pt., Ans.}$
14. $\frac{1}{4}\frac{7}{8}\text{gal.} = \frac{1}{2}\text{qt.} = 1\frac{5}{2}\text{qt.}; \frac{5}{2}\text{qt.} = \frac{5}{8}\text{pt.}; \frac{5}{8}\text{pt.} = \frac{1}{3}\text{gi.} = 3\frac{1}{3}\text{gi.}; \therefore 1\text{qt. } 3\frac{1}{3}\text{gi., Ans.}$
15. $\frac{5}{8}\text{lb.} = \frac{1}{2}\text{oz.} = 2\frac{1}{2}\text{oz.}; \frac{1}{2}\text{oz.} = 4\text{dr.}; \therefore 2\text{oz. } 4\text{dr., Ans.}$

16. $\frac{1}{8}$ m. = $\frac{2}{3}$ fur. = $2\frac{2}{3}$ fur.; $\frac{2}{3}$ fur. = $\frac{2}{3}$ ch. = $2\frac{2}{3}$ ch.;
 $\frac{2}{3}$ ch. = $\frac{2}{3}$ rd.; $\frac{2}{3}$ rd. = $2\frac{2}{3}$ li. = $22\frac{2}{3}$ li.; $\frac{2}{3}$ li. = $\frac{4}{5}$ in. =
 $1\frac{2}{5}$ in.; $\therefore$ 2fur. 2ch. 22li. $1\frac{2}{5}$ in., Ans.
17. $\frac{1}{5}$ c. = $\frac{6}{15}$ c.ft. = $4\frac{4}{5}$ c.ft.; $\frac{1}{5}$ c.ft. = $\frac{6}{15}$ cu.ft. =
 $4\frac{4}{5}$ cu.ft.; $\frac{1}{5}$ cu.ft. = $\frac{6}{15}$ c.in. = $460\frac{4}{5}$ c.in.; $\therefore$
4c.ft. 4cu.ft. $460\frac{4}{5}$ c.in., Ans.
18. $\frac{1}{8}$ yd. = $\frac{1}{8}$ qr. = $1\frac{1}{8}$ qr.; $\frac{1}{8}$ qr. = $\frac{2}{3}$ na. = $2\frac{2}{3}$ na.; $\frac{2}{3}$ na.
= $\frac{1}{2}$ in.; $\therefore$ 1qr. 2na. $\frac{1}{2}$ in., Ans.

(ART. 151, p. 115.)

4. 7oz. 4dwt. = 144dwt.; and 1lb. = 240dwt. $\therefore$ 7oz.
4dwt. = $\frac{1}{2}\frac{1}{2}$ lb. = $\frac{3}{4}$ lb., Ans.
6. 72sq.in. (= 72sq.ft. $\div$ 144) = $\frac{1}{2}$ sq.ft.; $\frac{1}{2}$ sq.ft. (= $\frac{1}{2}$ sq.yd. $\div$ 9) = $\frac{1}{9}$ sq.yd.; $20\frac{1}{9}$ sq.yd. (= $20\frac{1}{9}$ sq.rd. $\div$ 30) = $\frac{2}{3}$ sq.rd.; $2\frac{2}{3}$ sq.rd. (= $2\frac{2}{3}$ r. $\div$ 40) = $\frac{1}{5}$ r.; $1\frac{1}{5}$ r. (= $1\frac{1}{5}$ a. $\div$ 4) = $\frac{1}{4}$ a., Ans.
7. 9 $\frac{3}{8}$ gr. (= 9 $\frac{3}{8}$ dwt. $\div$ 24) = $\frac{2}{5}$ dwt.; 6 $\frac{2}{5}$ dwt. (= 6 $\frac{2}{5}$ oz. $\div$ 20) = $\frac{3}{5}$ oz.; 4 $\frac{3}{5}$ oz. (= 4 $\frac{3}{5}$ lb. $\div$ 12) = $\frac{9}{5}$ lb., Ans.

NOTE. — Omit divisors, setting down results.

8. 1pt. = $\frac{1}{2}$ qt.; $3\frac{1}{2}$ qt. = $7\frac{1}{2}$ pk.; $1\frac{1}{2}$ pk. = $\frac{3}{4}$ bush., Ans.
9. 30" = $\frac{1}{2}$ '; 20 $\frac{1}{2}$ ' = $12\frac{1}{2}$ °; 20 $12\frac{1}{2}$ ° = $2\frac{1}{2}$ ds.; 6 $2\frac{1}{2}$ ds. = $2\frac{1}{2}$ circ., Ans.
10. 2 $\frac{1}{4}$ b.c. = $\frac{5}{8}$ in.; $\frac{5}{8}$ in. = $\frac{1}{4}$ ft.; $1\frac{1}{4}$ ft. = $\frac{1}{4}$ yd.; 2 $\frac{1}{4}$ yd. = $\frac{3}{4}$ rd.; 11 $\frac{3}{4}$ rd. = $\frac{2}{3}$ fur.; 2 $\frac{2}{3}$ fur. = $\frac{1}{2}$ m.; 1 $\frac{1}{2}$ m. = $\frac{3}{4}$ l., Ans.
11. $\frac{1}{10}$ in. = $\frac{2}{5}$ na.; 2 $\frac{2}{5}$ na. = $\frac{3}{4}$ qr.; 1 $\frac{3}{4}$ qr. = $\frac{2}{3}$ yd., Ans.
12. 27m. = $\frac{9}{20}$ h.; 9 $\frac{9}{20}$ h. = $\frac{63}{100}$ d.; 6 $\frac{63}{100}$ d. = 11 $\frac{2}{3}$ wk.; 311 $\frac{2}{3}$ wk. = 44 $\frac{2}{3}$ l.m. = $\frac{3}{4}$ J.yr., Ans.
13. 1 $\frac{1}{2}$ gi. = $\frac{3}{4}$ pt.; 1 $\frac{3}{4}$ pt. = $\frac{1}{2}$ qt.; 1 $\frac{1}{2}$ qt. = $\frac{3}{4}$ gal., Ans.
14. 1382 $\frac{2}{3}$ cu.in. = $\frac{1}{2}$ cu.ft.; 12 $\frac{1}{2}$ cu.ft. = $\frac{1}{2}$ c.ft.; 4 $\frac{1}{2}$ c.ft. = $\frac{3}{4}$ c., Ans.

15. $10\text{gr.} = \frac{1}{2}\text{sc.}; \frac{1}{2}\text{sc.} = \frac{1}{2}\text{dr.}; \frac{1}{2}\text{dr.} = \frac{2}{16}\text{oz.}; 3\frac{2}{16}\text{oz.}$
 $= \frac{3}{4}\text{lb., Ans.}$
16. $20\text{li.} = \frac{4}{5}\text{rd.}; 2\frac{4}{5}\text{rd.} = \frac{7}{10}\text{ch.}; 5\frac{7}{10}\text{ch.} = \frac{57}{100}\text{fur.};$
 $4\frac{57}{100}\text{fur.} = \frac{457}{100}\text{m., Ans.}$
17. $12\frac{4}{5}\text{dr.} = \frac{7}{5}\text{oz.}; 1\frac{7}{5}\text{oz.} = \frac{1}{5}\text{lb.}; 11\frac{1}{5}\text{lb.} = \frac{1}{4}\text{qr.} = \frac{1}{8}\text{cwt.};$
 $11\frac{1}{8}\text{cwt.} = \frac{5}{8}\text{t., Ans.}$
18. $1\text{pt.} = \frac{1}{2}\text{qt.}; \frac{1}{2}\text{qt.} = \frac{2}{16}\text{pk.}; 1\frac{2}{16}\text{pk.} = \frac{2}{64}\text{bush.};$
 $3\frac{2}{64}\text{bush.} = \frac{2}{16}\text{bush., Ans.}$

(ART. 152, p. 117.)

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|-----|-------------------------------|-----|-----------------|-----|----------------|
| 6. | $\frac{22}{4} = 1\frac{5}{4}$ | 11. | $\frac{12}{5}$ | 20. | $1\frac{1}{6}$ |
| 7. | $\frac{13}{4}$ | 13. | $5\frac{1}{6}$ | 22. | $5\frac{1}{2}$ |
| 9. | $\frac{11}{4}$ | 16. | $1\frac{7}{36}$ | | |
| 10. | $2\frac{5}{2}$ | 18. | $\frac{11}{2}$ | | |
24. $\frac{3}{8}\text{gal.} = \frac{1}{5}\text{qt.}; \frac{1}{5}\text{qt.} + \frac{1}{3}\text{qt.} = \frac{4}{15}\text{qt.,}$
 $\frac{4}{15}\text{qt.} = \frac{1}{12}\text{gal.}; \frac{1}{12}\text{gal.} + \frac{3}{5}\text{gal.} = \frac{4}{5}\text{gal., } \left. \vphantom{\frac{3}{8}\text{gal.}} \right\} \text{Ans.}$
25. $\frac{2}{5}\text{pk.} = \frac{1}{10}\text{bush.}; \frac{5}{8}\text{qt.} = \frac{5}{48}\text{pk.} = \frac{5}{192}\text{bush.}; \frac{1}{3}\text{bush.}$
 $+ \frac{1}{10}\text{bush.} + \frac{5}{192}\text{bush.} = \frac{11}{128}\text{bush.} = \frac{1}{16}\text{pk.} =$
 $14\frac{1}{16}\text{qt., Ans.}$
26. $\frac{3}{8}\text{cwt.} = \frac{3}{160}\text{t.}; \frac{1}{2}\text{qr.} = \frac{1}{8}\text{cwt.} = \frac{1}{160}\text{t.}; \frac{2}{5}\text{t.} + \frac{1}{160}\text{t.}$
 $+ \frac{1}{160}\text{t.} = \frac{31}{80}\text{t.} = 8\frac{3}{8}\text{cwt.} = 34\frac{3}{8}\text{qr., Ans.}$

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|-----|------------------|-----|------------------|-----|-----------------|-----|------------------|
| 29. | $\frac{49}{63}$ | 33. | $47\frac{1}{36}$ | 35. | 7 | 37. | $41\frac{5}{6}$ |
| 32. | $48\frac{2}{35}$ | 34. | $38\frac{1}{10}$ | 36. | $13\frac{5}{8}$ | 38. | $35\frac{5}{18}$ |

(ART. 153, p. 119.)

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|----|--------------------------------|-----|-----------------|-----|-----------------|-----|-----------------|
| 3. | $\frac{12}{3}$ | 8. | $\frac{21}{5}$ | 16. | $\frac{13}{8}$ | 24. | $\frac{4}{15}$ |
| 4. | $\frac{39}{7}$ | 9. | $\frac{22}{9}$ | 17. | $\frac{5}{12}$ | 25. | $\frac{2}{9}$ |
| 5. | $\frac{22}{14} = \frac{11}{7}$ | 10. | $\frac{9}{25}$ | 20. | $\frac{3}{308}$ | 26. | $\frac{5}{36}$ |
| 6. | $\frac{1}{3}$ | 13. | $\frac{11}{17}$ | 23. | $\frac{1}{3}$ | 29. | $1\frac{1}{10}$ |

31. $\frac{1}{6}$ pt. = $\frac{1}{12}$ qt. $\frac{3}{4}$ qt. = $\frac{1}{2}$ qt. = $\frac{7}{12}$ qt., or $1\frac{1}{6}$ pt., Ans.
 32. $\frac{3}{4}$ cwt. = $\frac{3}{140}$ t. $\frac{3}{4}$ t. = $\frac{21}{140}$ t., or $12\frac{3}{20}$ cwt., Ans.
 33. $\frac{1}{3}$ rd. = $\frac{3}{840}$ a. $\frac{3}{4}$ a. = $\frac{18}{840}$ a., or $67\frac{2}{3}$ rd., Ans.
 34. $\frac{3}{4}$ h. = $\frac{1}{32}$ wk. $\frac{1}{5}$ wk. = $\frac{387}{1920}$ wk., or $1\frac{1}{2}$ d.,
 or $33\frac{1}{3}$ h., Ans.
 37. $\frac{7}{8}$ 41. $7\frac{3}{4}$ 43. $5\frac{1}{2}$

MISCELLANEOUS EXAMPLES IN FRACTIONS, p. 121.

- | | |
|-----------------------|--|
| 2. $1\frac{1}{4}$ | 7. $2\frac{16}{27}$ |
| 3. $\frac{3}{4}$ | 8. $\frac{3}{1}, \frac{18}{2}, \frac{27}{3}, \frac{36}{4}, \frac{45}{5}, \frac{54}{6}$ |
| 4. $15\frac{18}{104}$ | 9. $\frac{3}{2} = 4\frac{1}{2}$ |
| 5. $7\frac{137}{88}$ | 10. $\frac{16}{23}$ |
| 6. $2\frac{1}{2}$ | 11. $\frac{48}{55}$ |
12. $\frac{3}{4}$ d. = $\frac{1}{2}$ h. = $10\frac{3}{4}$ h.; $\frac{3}{4}$ h. = 12^m = $17\frac{1}{2}$ m.; $\frac{1}{4}$ m. = 6^s sec. = $8\frac{1}{2}$ sec.; $\therefore$ 10h. 17m. $8\frac{1}{2}$ sec., Ans.
 13. 1pt. = $\frac{1}{2}$ qt.; $5\frac{1}{2}$ qt. = $11\frac{1}{2}$ pk.; $31\frac{1}{2}$ pk. = $6\frac{1}{2}$ bush., Ans.
 14. 86 22. $\frac{12}{5}$
 15. $2\frac{2}{3}$ 23. $\frac{105}{385}, \frac{308}{385}, \frac{375}{385}$
 16. $\frac{3}{4}$ 24. $\frac{16}{20}, \frac{18}{20}, \frac{18}{20}$
 17. 30 25. $\frac{15}{11}, \frac{15}{11}$
 18. $14\frac{2}{5}$ 26. $\frac{8}{12}, \frac{8}{16}, \frac{8}{15}$
 19. 36 27. $\frac{175}{272}$
 20. 2 28. $\frac{35}{96}$
 21. $\frac{1}{2}$ 29. $\frac{3}{64}$
 30. $\frac{3}{8}$ gal. = $\frac{3}{2}$ qt., Ans.
 31. $\frac{3}{8}$ h. = $\frac{1}{64}$ d. = $1\frac{1}{8}$ wk., Ans.
 32. $\frac{\frac{1}{2} \times \frac{3}{4} \times \frac{7}{8} \times \frac{11}{12}}{\frac{3}{8} \times \frac{2}{3} \times \frac{5}{11} \times \frac{7}{12}} = \frac{4 \times 2 \times 7 \times 15 \times 9 \times 4 \times 11}{5 \times 3 \times 8 \times 11 \times 8 \times 3 \times 7} = \frac{11 \times 12}{5 \times 7} = \frac{12}{5} = 3\frac{3}{5}$, Ans.

33. 25 | 35. $7\frac{5}{8} = 9\frac{3}{8}$
 34. 15 | 36. $\frac{1}{3}$
 37. $\frac{1}{5}s. = 100£$; $\frac{1}{8}d. = 27s. = 540£$; $\frac{3}{8}£ + 100£ + 540£$
 $= 208\frac{3}{8}£$, or $712\frac{3}{8}s.$, or $92\frac{3}{8}d.$, Ans.
 38. $\frac{3}{8}gi. = 20pt. = 40qt. = 160gal.$; $\frac{1}{8}gal. - 160gal. =$
 $61\frac{3}{8}gal.$, or $136\frac{3}{8}qt.$, or $37\frac{3}{8}pt.$, or $13\frac{7}{8}gi.$, Ans.
 39. $2\frac{1}{3} = 1\frac{2}{3}$ 40. $\frac{3}{8} = \frac{1}{2}$
 41. $3gi. = \frac{1}{2}pt.$; $1\frac{1}{2}pt. = \frac{1}{8}qt.$; $3\frac{1}{8}qt. = 3\frac{1}{2}gal.$; $5\frac{3}{8}gal.$
 $= 13\frac{1}{2}gal.$, Ans.
 42. $\frac{3}{8}$, i. e., the whole.

EXAMPLES IN ANALYSIS.

(ART. 154, p. 123.)

2. If 3 acres cost \$81, then 1 acre will cost $\frac{1}{3}$ of \$81, which is \$27; and if 1 acre costs \$27, then 12 acres will cost 12 times \$27, which is \$324, Ans.
 3. $\$24 \div 3 \times 16 = \$128$, Ans.
 4. $8c. \div 4 \times 7 = 14c.$, Ans.
 6. $\$40 \times \frac{7}{8} = \$35$, Ans.
 7. $12a. \times \frac{5}{6} = 10a.$, Ans.
 8. $18a. \div 9 \times 5 = 10a.$, Ans.
 10. $63c. \div \frac{7}{8} = 72c.$, Ans.
 11. $\$75 \div \frac{5}{8} = \$120$, Ans.
 12. $234bush. \div \frac{3}{5} = 390bush.$, Ans.
 14. $\$3\frac{1}{4} \div \frac{5}{8} \times \frac{3}{4} = \$\frac{15 \times 8 \times 3}{4 \times 5 \times 8} = \$4\frac{1}{2}$, Ans.
 15. $\$8769 \div \frac{3}{16} \times \frac{5}{8} = \$29230$, Ans.

$$16. \quad 32m. \div \frac{4}{3} \times \frac{5}{12} = 30m., \text{ Ans.}$$

$$17. \quad \frac{5 \times 4 \times 6}{8 \times 3} = 5rd., \text{ Ans.}$$

EXPLANATION. — If 3 men build $\frac{1}{3}$ rd. in 1 hour, then 1 man will build $\frac{1}{9}$ of $\frac{1}{3}$ rd. in 1 hour, and 4 men 4 times as much in 1 hour, and in 6 hours 6 times as much as in 1 hour, i. e., 5rd., Ans

$$18. \quad \frac{7 \times 6}{2 \times 4} = 5\frac{1}{4}d., \text{ Ans.}$$

$$19. \quad 8\frac{1}{3}c. \times 6 = 50c., \text{ Ans.}$$

$$20. \quad 4c. \times 16\frac{1}{2} = 66c., \text{ Ans.}$$

$$21. \quad 12\frac{1}{2}c. \times 4 = 50c.; 50c. \div 16\frac{2}{3}c. = 3, \text{ No. doz., Ans.}$$

$$22. \quad 6c. \times 12\frac{1}{2} = 75c., \text{ Ans.}$$

$$23. \quad \frac{5 \times 8 \times 25}{4 \times 5 \times 2} = \$25, \text{ Ans.}$$

$$24. \quad \frac{56 \times 7}{7 \times 2} = \$28, \text{ Ans.}$$

$$26. \quad \$1\frac{1}{4} \times 12\frac{1}{2} = \$15\frac{3}{8}. \text{ Ans.}$$

$$27. \quad 20\frac{1}{2}m. = 108240ft.; 108240ft. \div 9ft. = 12026\frac{2}{3}, \text{ Ans.}$$

$$28. \quad 6\frac{1}{2} \times 5\frac{1}{2} \times 3\frac{3}{8} = 117 \text{ ft., Ans.}$$

$$29. \quad 21gal. = 168 \text{ pt.}; 168pt. \div 1\frac{3}{4}pt. = 96, \text{ Ans.}$$

$$30. \quad \$96\frac{1}{2} \times 75\frac{1}{2} = \$7285\frac{3}{4}, \text{ Ans.}$$

$$31. \quad \$16\frac{1}{2} \div \$8\frac{1}{4} = 2; 8\frac{1}{2}m. \times 2 = 17m., \text{ Ans.}$$

$$32. \quad \frac{20a. \times 3 \times 2}{4 \times 3} = 10a., \text{ Ans.}$$

$$33. \quad 3\frac{3}{4}\text{bush.} \times 7\frac{1}{2} = 27\text{bush., Ans.}$$

$$34. \quad 3 \div \frac{3}{4} = 4, \text{ i. e., the shadow is } \frac{1}{4} \text{ as long as the staff;}$$

$$\therefore 125\frac{1}{2}ft. \div 4 = 31\frac{3}{8}ft., \text{ Ans.}$$

$$35. \quad \text{The staff is 4 times as long as the shadow; } \therefore \text{ the steeple is } 31\frac{3}{8}ft. \times 4 = 125\frac{1}{2}ft., \text{ Ans.}$$

$$36. \quad \text{If } \$43\frac{3}{4} \text{ is } \frac{7}{8}, \text{ then } \frac{1}{8} \text{ is } \frac{1}{7} \text{ of } \$43\frac{3}{4} = \$6\frac{1}{4}, \text{ and } \frac{3}{8}, \text{ or the whole, is 8 times } \$6\frac{1}{4} = \$50, \text{ Ans.}$$

37. $33\frac{1}{2}\text{lb.} \times 24 = 804\text{lb.}$, 1st Ans.; $\$ \frac{1}{4} \times 804 = \$201$, 2d Ans.
39. If 12 is $\frac{3}{5}$, then 4 is $\frac{1}{5}$ and 20 is $\frac{5}{5}$; $7\frac{2}{5}$ times 20 = 148, Ans.
41. If 24 is $\frac{6}{11}$, then 4 is $\frac{1}{11}$, and 44 is $\frac{11}{11}$; 2 in 44, 22 times, Ans.
42. If 35 is $\frac{7}{4}$, then 5 is $\frac{1}{4}$ and 20 is $\frac{4}{4}$; 5 in 20, 4 times, Ans.
44. $\frac{1}{8}$ of 40 is 5 and $\frac{3}{8}$ are 15; if 15 is $\frac{3}{7}$, then 5 is $\frac{1}{7}$, and 35 is 7; 5 in 35, 7 times, Ans.
45. $\frac{1}{3}$ of 48 is 16 and $\frac{7}{8}$ are 42; if 42 is $\frac{21}{8}$, then 2 is $\frac{1}{8}$, and 32 is $\frac{16}{8}$; 8 in 32, 4 times, Ans.
47. $\frac{1}{3}$ of 64 is 21 and $\frac{2}{3}$ are 40, if 40 is $\frac{4}{5}$, then 10 is $\frac{1}{5}$ and 50 is $\frac{5}{5}$; $\frac{1}{3}$ of 75 is 25, and 25 in 50, 2 times, Ans.
48. $\frac{1}{4}$ of 35 is 8 and $\frac{3}{4}$ are 20; if 20 is $\frac{2}{5}$, then 10 is $\frac{1}{5}$ and 100 is $\frac{10}{5}$; $\frac{1}{8}$ of 40 is 5, and 5 in 100, 20, Ans.
49. $\frac{3}{8} + \frac{1}{4} + \frac{1}{10} + \frac{1}{5} = \frac{15 + 10 + 4 + 8}{40} = \frac{37}{40}$; $\frac{37}{40} - \frac{37}{40} = \frac{3}{40}$. Now 246 persons are $\frac{3}{40}$ of the population;
 $\therefore \frac{1}{40}$ of the population is $246 \div 3 = 82$, and $\frac{49}{40}$ of it = 40 times 82 = 3280, Ans.
50. In this Ex. 123 are $\frac{3}{40}$ of the population, and $\frac{49}{40}$ are 1640, Ans.
51. $(16\frac{1}{2}\text{ft.} + 15\text{ft.}) \times 2 = 63\text{ft.}$, distance round the room.
 $63 \times 9 = 567$, Ans.
52. $16\frac{1}{2} \times 15 = 247\frac{1}{2}$, area in sq.ft. of the floor. $247\frac{1}{2} \div 9 = 27\frac{1}{2}$, No. yd.; $\$1\frac{1}{2} \times 27\frac{1}{2} = \$41\frac{1}{4}$, Ans.
53. $48\frac{3}{8} + 28\frac{3}{4} + 25\frac{3}{8} + 56\frac{5}{8} = 159$, No. lb., 1st Ans.
 $25\text{c.} \times 159 = \$39\frac{3}{4}$, 2d Ans.
54. $\frac{1}{2} + \frac{1}{4} + \frac{1}{12} = \frac{6 + 3 + 1}{12} = \frac{10}{12} = \frac{5}{6}$; $\frac{6}{6} - \frac{5}{6} = \frac{1}{6}$.
 Now the 14 scholars are $\frac{1}{6}$ of the school; $\therefore \frac{5}{6}$ of it = 6 times 14 = 84, Ans.

55. In this Ex. 7 scholars are $\frac{1}{8}$ of the school, and $\therefore \frac{8}{1}$ of it = 42, Ans.
56. The hound gains 2 rods while the fox runs 20; $\therefore$, as he must gain 8 times 2 rods, the fox must run 8 times 20 = 160 rods, Ans.
57. The hound gains 3 rods in running 25; $\therefore$, as he must gain 6 times 3 rods, he must run 6 times 25 = 150 rods, Ans.
58. He now has 1 *flock*, and if he had one and one half times as many more, he would have $2\frac{1}{2}$ *flocks*. Then not having the 6 doves, he would have only 50 *doves*; $\therefore$ 50 doves = $2\frac{1}{2}$ *flocks*, and $50 \div 2\frac{1}{2} = 20$, No. in 1 flock, Ans.
59. Reasoning as in Ex. 58, $24\frac{1}{2}$ lambs = $3\frac{1}{2}$ *flocks*, and $24\frac{1}{2} \div 3\frac{1}{2} = 7$, No. in 1 flock, Ans.
60. $\frac{3+2}{4+2} = \frac{5}{6}$; $\frac{5}{6} - \frac{3}{4} = \frac{1}{12}$, Increase, Ans.
61. $\frac{4+2}{3+2} = \frac{6}{5}$; $\frac{4}{3} - \frac{6}{5} = \frac{2}{15}$, Decrease, Ans.
63. $\frac{5}{8} \times \frac{2}{5} = \frac{1}{4}$; if \$3000 is $\frac{1}{4}$, then $\frac{1}{4}$ are 4 times \$3000 = \$12000, Ans.
64. A can do $\frac{1}{6}$ of the work in 1 day; B can do $\frac{1}{12}$ in 1 day; $\therefore$ A and B can do $\frac{1}{6} + \frac{1}{12} = \frac{1}{4}$ of it in 1 day. Hence, $\frac{1}{4} \div \frac{1}{4} = 4$, No. of days, Ans.
65. A, B, and C can do $\frac{1}{4}$ of the work in 1 day; A and B can do $\frac{1}{6}$ of it in one day; $\therefore$ C can do $\frac{1}{4} - \frac{1}{6} = \frac{1}{12}$ of it in one day; hence he can do $\frac{2}{20}$ of it in 20 days, Ans.
66. The horse cost $\frac{1}{4}$ of his own price; $\therefore$ the horse and oxen cost $\frac{2}{4}$ of the price of the horse; i. e. \$180 is $\frac{2}{4}$ of the price of the horse, and $\$180 \div 2 = \$90$ is $\frac{1}{4}$

of the price of the horse. Hence $\$20 \times 4 = \$80$, price of horse, Ans.

67. The oxen cost $\frac{1}{4}$ of their own price; $\therefore$ the oxen and horse cost $\frac{1}{4}$ of the price of the oxen; i. e. $\$175$ is $\frac{1}{4}$ of the price of the oxen, and $\$175 \div 7 = \$25$ is $\frac{1}{4}$ of the price of the oxen. Hence $\$25 \times 3 = \$75$, price of the horse; and $\$75 \times \frac{3}{2} = \$45$, price of wagon, Ans.
68. $\frac{8 \times 3 \times 6}{3 \times 2} = 24$, No. yd. when $1\frac{1}{2}$ yd. wide; $24 \div \frac{1}{4} = 32$, No. yd. when $\frac{1}{4}$ yd. wide, Ans.
69. $\frac{2}{3} - \frac{1}{2} = \frac{1}{6}$, Remainder after wife's share; $\frac{1}{2} \times \frac{2}{3} = \frac{1}{3}$, Son's share; $\frac{1}{2} - \frac{1}{3} = \frac{1}{6}$, Remainder after son's share; $\frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$, Daughter's share; $\therefore \$376\frac{1}{2}$ is $\frac{1}{12}$ of the estate, and $\frac{1}{12}$ are 12 times $\$376\frac{1}{2} = \$4513\frac{1}{2}$, Ans.
70. If $\$37\frac{1}{2}$ is $\frac{3}{4}$, then $\frac{1}{4}$ is $\frac{1}{3}$ of $\$37\frac{1}{2} = \$12\frac{1}{2} = \$12.50$, Ans., for, if the watch was sold for $\frac{3}{4}$ of the cost, the remaining $\frac{1}{4}$ was lost.
71. $\$100 \div \$1\frac{2}{3} = 62\frac{1}{2}$, No. of days, Ans.
72. 1a. = 43560 sq. ft.; $43560 \div \frac{3}{4} = 58080$, No. of ft. in furrow; 58080 ft. = 11m., Ans.
73. $14\frac{2}{3} \times 9 = 132$, No. of hours in which he can perform it; $132 \text{ h.} \div 8\frac{1}{2} \text{ h.} = 16$, No. of days, Ans.
74. $\$2\frac{2}{3} \times 9 = \$2$, cost of coffee; $\$2 \div \$\frac{1}{4} = 8$, No. lb. of butter, Ans.
75. $16\frac{2}{3} \div 1\frac{1}{3} = 9$, No. of coats, Ans.
76. $15\frac{3}{4} \text{ yd.} \times 3 = 47\frac{1}{4} \text{ yd.}$ necessary for 3 dresses; $50 - 47\frac{1}{4} = 2\frac{3}{4}$, No. yd. remaining, Ans.
77. Since the *exterior* dimensions are 2 inches greater than the *interior*, the top and bottom are respectively 2 ft. 8 in. = $2\frac{2}{3}$ ft. in length and width; each *side* is $2\frac{2}{3}$ ft.

long and $1\frac{1}{2}$ ft. wide; and each *end* $2\frac{1}{2}$ ft. long and $1\frac{1}{2}$ ft. wide. Hence,

$$\frac{8 \times 8 \times 2 \times 36}{3 \times 3} = 512 \text{sq.ft., top and bt'm of 36 bxs.}$$

$$\frac{8 \times 7 \times 2 \times 36}{3 \times 4} = 336 \text{sq.ft., 2 sides of 36 boxes.}$$

$$\frac{5 \times 7 \times 2 \times 36}{2 \times 4} = 315 \text{sq.ft., 2 ends of 36 boxes.}$$

$$1163 \text{sq.ft., Ans.}$$

78. The top and bottom are respectively $2\frac{1}{2}$ ft. in length and width; each *side* is $2\frac{1}{2}$ ft. long and 1 ft. 7 in. = $1\frac{7}{12}$ ft. wide; and each *end* 2 ft. 4 in. = $2\frac{1}{3}$ ft. long and $1\frac{1}{2}$ ft. wide. Hence,

$$\frac{5 \times 5 \times 2 \times 36}{2 \times 2} = 450 \text{sq.ft., top and bt'm of 36 bxs.}$$

$$\frac{5 \times 19 \times 2 \times 36}{2 \times 12} = 285 \text{sq.ft., 2 sides of 36 boxes.}$$

$$\frac{7 \times 19 \times 2 \times 36}{3 \times 12} = 266 \text{sq.ft., 2 ends of 36 boxes.}$$

$$1001 \text{sq.ft., 1st Ans.}$$

The capacity of one box of each kind may be found by multiplying its three interior dimensions together, and then the *difference* between these products multiplied by 36 will give the 2d Ans. But, more easily, since one of the smaller boxes will exactly *fit into* one of the larger, it is manifest that one of the larger boxes will hold just what one of the smaller ones will hold, *plus the boards which compose the smaller box*; i. e., the difference in the capacities of the two sets of boxes is just the *volume of the boards used in making the smaller boxes*. Now 1 ft. of board equals 144 c.in. of wood, $\therefore 144 \text{c. in.} \times 1001 = 144144 \text{c.in., 2d Ans.}$

DECIMAL FRACTIONS.

(ART. 167, p. 131.)

3.	.0342	9.	.0000246
4.	.641	10.	1000.00002
5.	.0518	11.	11.0000000011
6.	800.008	12.	616.000000000016
7.	6000.000006	13.	10000.0004
8.	930.8	14.	.00325487

(ART. 168, p. 131.)

- Forty-two and fifty-six hundredths.
- Three and seven hundred and eighty-nine thousandths.
- Eight hundred and ninety-two and six thousand, seven hundred and fifty-eight ten-thousandths.
- Nine hundred and eighty-seven and twenty-three thousand, eight hundred and seventy-six hundred-thousandths.
- Twenty-nine and forty-five hundred-thousandths.
- One and eight hundred thousand, six hundred and forty-seven millionths.
- Three thousand, six hundred and ninety-four and eight hundred and seventy-six thousand, nine hundred and forty-two millionths.
- Seven hundred and sixty and four millions, seventy thousand, eight hundred and twenty-three ten-millionths.
- Four thousand and four and forty millions, forty thousand, and four hundred-millionths.
- Three thousand, three hundred and thirty-three and thirty-three millions, three hundred and thirty-three thousand, three hundred and thirty-three hundred-millionths.

11. Forty-six and forty-six thousand, four hundred and eighty-two hundred-millionths.
12. Eight thousand, seven hundred and sixty-nine and twenty-seven millions, six hundred and forty-two thousand, nine hundred and thirty-five hundred-millionths.

(ART. 169, p. 132.)

4.	2391547.859278	9.	3653.24742
5.	1536850.22677657941	11.	2101.394
7.	785.97943	12.	1874.00697
8.	8031.0744		

(ART. 170, p. 133.)

5.	1315.5946648	9.	9.999994
6.	4418.294	10.	.39
7.	416.4929		

(ART. 171, p. 135.)

11.	19.9893954	19.	23648700
12.	.0000793098	20.	37428000
13.	.0248999064	24.	11022
14.	.0009108027	25.	22029560
17.	9876.5	27.	.0000000000884
18.	34869000	28.	421000

(ART. 172, p. 137.)

7.	.0065	17.	.48
8.	36.4	19.	.48666+
9.	3.76	20.	1.59655+
10.	4.78	23.	8.469
13.	1125	24.	.005647
14.	.01625	27.	.007053375
15.	45	28.	.06081+
16.	34.8	30.	1767.5

(ART. 173, p. 139.)

$$5. \quad 2.40625 \mid 9. \quad \left\{ \begin{array}{l} .5, .4, .375, .8125, \\ .109375, .28, .34 \end{array} \right.$$

(ART. 174, p. 139.)

$$13. \quad \frac{11}{40}, \frac{13}{40}, \frac{1}{4000}, \frac{1}{160} \mid 15. \quad \frac{3}{2}, \frac{15}{4}, \frac{33}{4}, \frac{73}{8}, \frac{161}{80}$$

(ART. 175, p. 140.)

$$\begin{array}{r|l} 4. & 16 \mid 8. \\ & 25 \mid 20.5 \\ & 4 \mid 2.82 \\ & 20 \mid 3.705 \\ \hline \text{Ans.} & .18525 \end{array}$$

$$\begin{array}{r|l} 5. & 24 \mid 18. \\ & 20 \mid 12.75 \\ & 12 \mid 3.6375 \\ \hline \text{Ans.} & .303125 \end{array}$$

$$\begin{array}{r|l} 6. & 20 \mid 10. \\ & 3 \mid 1.5 \\ & 8 \mid 4.5 \\ & 12 \mid 6.5625 \\ \hline \text{Ans.} & .546875 \end{array}$$

$$\begin{array}{r|l} 8. & 60 \mid 30'' \\ & 60 \mid 0.5' \\ & 30 \mid 15.00833^{\circ}+ \\ & 12 \mid 3.500277+ \\ \hline \text{Ans.} & .291689+ \end{array}$$

$$\begin{array}{r|l} 9. & 60 \mid 24. \\ & 60 \mid 18.4 \\ & 24 \mid 6.30666+ \\ & 7 \mid 2.26277+ \\ \hline \text{Ans.} & .32325+ \end{array}$$

$$\begin{array}{r|l} 10. & 4 \mid 1. \\ & 2 \mid 1.25 \\ & 4 \mid 2.625 \\ \hline \text{Ans.} & .65625 \end{array}$$

$$\begin{array}{r|l} 11. & 25 \mid 10. \\ & 4 \mid 2.4 \\ & 10 \mid 8.6 \\ & 8 \mid 3.86 \\ \hline \text{Ans.} & .4825 \end{array}$$

$$\begin{array}{r|l} 12 & 1728 \mid 144. \\ & 27 \mid 8.08333+ \\ \hline \text{Ans.} & .29938+ \end{array}$$

$$\begin{array}{r}
 13. \quad 30\frac{1}{4} \quad 20. \\
 \underline{4} \quad \underline{4.} \\
 121 \quad 80. \\
 40 \quad 2,66115+ \\
 \underline{4} \quad \underline{3.06652+} \\
 \text{Ans.} \quad .76663+
 \end{array}$$

$$\begin{array}{r}
 14. \quad 3 \quad 2. \\
 12 \quad 9.66666+ \\
 3 \quad 1.80555+ \\
 5\frac{1}{2} \quad 5.60185+ \\
 \underline{2} \quad \underline{2} \\
 11 \quad 11.20370+ \\
 \quad 1.01851+ \\
 \quad 30. \\
 40 \quad 31.01851+ \\
 8 \quad 5.77546+ \\
 \underline{\hspace{1cm}} \\
 \text{Ans.} \quad .72193+
 \end{array}$$

(ART. 176, p. 142.)

$$\begin{array}{r}
 2. \quad .984375 \text{ bush.} \\
 \underline{4} \\
 3.937500 \text{ pk.} \\
 \underline{8} \\
 7.5000 \text{ qt.} \\
 \underline{2} \\
 1.0 \text{ pt.} \\
 \text{Ans. 3pk. 7qt. 1pt.}
 \end{array}$$

$$\begin{array}{r}
 3. \quad .40625 \text{ gal.} \\
 \underline{4} \\
 1.62500 \text{ qt.} \\
 \underline{2} \\
 1.250 \text{ pt.} \\
 \underline{4} \\
 1.00 \text{ gi.} \\
 \text{Ans. 1qt. 1pt. 1gi.}
 \end{array}$$

$$\begin{array}{r}
 4. \quad .9022881 \text{ m.} \\
 \underline{4} \\
 3.609152 \text{ wk.} \\
 \underline{7} \\
 4.264064 \text{ d.} \\
 \underline{24} \\
 6.337536 \text{ h.} \\
 \underline{60} \\
 20.252160 \text{ m.} \\
 \underline{60} \\
 15.12960 \text{ sec.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ans. 3wk. 4d. 6h. 20m.} \\
 15.1296 \text{ sec.}
 \end{array}$$

5. .90625yd.

$$\begin{array}{r} 4 \\ \hline 3.62500\text{qr.} \end{array}$$

$$\begin{array}{r} 4 \\ \hline 2.500\text{na.} \end{array}$$

$$\begin{array}{r} 2\frac{1}{4} \\ \hline 1.125\text{in.} \end{array}$$

Ans. 3qr. 2na. 1.125in.

$$\begin{array}{r} 6. \quad .375^{\circ} \\ \hline 60 \\ \hline 22.500' \\ \hline 60 \\ \hline 30.0'' \end{array}$$

Ans. 22' 30".

$$\begin{array}{r} 7. \quad .375\text{t.} \\ \hline 20 \\ \hline 7.500\text{cwt.} \\ \hline 4 \\ \hline 2.0\text{qr.} \end{array}$$

Ans. 7cwt. 2qr.

$$\begin{array}{r} 8. \quad .4658\text{lb.} \\ \hline 12 \\ \hline 5.5896\text{oz.} \\ \hline 20 \\ \hline 11.7920\text{dwt.} \\ \hline 24 \\ \hline 19.008\text{gr.} \end{array}$$

Ans. 5oz. 11dwt. 19.008gr.

$$\begin{array}{r} 9. \quad .3587\text{m.} \\ \hline 8 \\ \hline 2.8696\text{fur.} \\ \hline 40 \\ \hline 34.7840\text{rd.} \\ \hline 5\frac{1}{2} \\ \hline 4.312\text{yd.} \\ \hline 3 \\ \hline .936\text{ft.} \\ \hline 12 \\ \hline 11.232\text{in.} \end{array}$$

Ans. 2fur. 34rd. 4yd. 11.232in.

$$\begin{array}{r} 10. \quad .562\text{lb.} \\ \hline 12 \\ \hline 6.744\text{oz.} \\ \hline 8 \\ \hline 5.952\text{dr.} \\ \hline 3 \\ \hline 2.856\text{sc.} \\ \hline 20 \\ \hline 17.120\text{gr.} \end{array}$$

Ans. 6oz. 5dr. 2sc. 17.12gr.

MISCELLANEOUS EXAMPLES IN DECIMAL FRACTIONS.

(p. 142.)

1. $12c. \times 6.25 = 75c.$, Ans.
2. $\$12.50 \times 4.5 = \$56.25$, Ans.
3. $\$62.50 \times 8 = \$500$, Ans.
4. $\$500 \div 8 = \$62.50$, Ans.
5. $\$500 \div \$62.50 = 8$, Ans.
6. $\$75 - \$62.50 = \$12.50$; $\$100 \div \$12.50 = 8$, Ans.
7. $\$600 \div 8 = \$75$; $\$75 - \$62.50 = \$12.50$, gain per acre; $\$12.50 \times 8 = \$100$, total gain.
8. $43a. 3r. 20rd. = 43.875a.$; $\$40 \times 43.875 = \$1755$, Ans.
9. $3t. 15cwt. 2qr. 12\frac{1}{2}lb. = 3.78125t.$; $\$6 \times 3.78125 = \$22.6875$, Ans.
10. $\$6 \times 12.25 = \$73.50$, Ans.
11. $\$6.25 \times 7\frac{3}{4} = \$48.4375$, Ans.
12. $24m. 3 fur. 20rd. = 24.4375m.$; $\$5775 \times 24.4375 = \$141126.5625$, Ans.
13. $(40.5rd. + 30.5rd.) \times 2 = 142rd.$, distance round; $\$1 \times 142 = \$142$, Ans.
14. $3yd. 3qr. 2na. = 3.875yd.$; $16c. \times 3.875 = 62c.$, Ans.
15. $40.5 \times 25.75 = 1042.875$, No. rd.; $1042.875rd. = 6a. 2r. 2.875rd.$, Ans.
16. $4.5cwt. \times 16 = 72cwt.$; $\$10.50 \times 72 = \$756$, Ans.
17. $\$7 \times .825 = \$5.775$, Ans.
18. $.825cwt. = .04125t.$; $\$7 \times .04125 = \$0.28875$, Ans.
19. $2\text{£ } 5s. 6d. 1qr. = 2\frac{53}{192}\text{£}$; $2\frac{53}{192}\text{£} \times .25 = .56901\frac{1}{24}\text{£} = 11s. 4d. 2.25qr.$, Ans.

20. .75cwt. = .0375t.; $2\frac{5}{8}\text{£} \times .0375\text{t.} = .08535\frac{5}{32}\text{£} =$
1s. 8d. 1.9375qr., Ans.
21. $3\text{£ } 9\text{s. } 6\text{d. } 1\text{qr.} = 3\frac{4}{8}\frac{1}{8}\text{£}$; $5\text{a. } 2\text{r. } 15\text{rd.} = 5\frac{1}{2}\text{a.}$;
 $3\frac{4}{8}\frac{1}{8}\text{£} \times 5\frac{1}{2} = 19.444\frac{1}{8}\text{£} = 19\text{£ } 8\text{s. } 10\text{d. } 2.34375\text{qr.}$
Ans.
22. $365\frac{1}{4}\text{d.} \times .785 = 286.721\frac{1}{4}\text{d.} = 286\text{d. } 17\text{h. } 18\text{m. } 36\text{sec.}$,
Ans.
23. $\$2.25 \times 15 = \$33.75$
 $\$3.50 \times 12.5 = \$43.75$
 $\$3.25 \times 8.8 = \$28.60$
Ans. $\$106.10$
24. $4.1\text{rd.} + 4\text{rd.} + .9\text{rd.} = 9\text{rd.}$ distance round; $\$3.75 \times$
 $9 = \$33.75$, Ans.
25. $8.75\text{m.} \times 8.4 = 73.5\text{m.}$, Ans.
26. $1687.5\text{bush.} \div 37.5\text{bush.} = 45$, Ans.
27. $35.75\text{yd.} \div 2.75\text{yd.} = 13$, Ans.
28. $\$20.125 \div \$1.75 = 11.5$, Ans.
29. $18.25 \times 2.8 = 51.1$, No. sq. ft., Ans.
30. $1\text{t. } 2\text{cwt. } 3\text{qr. } 12\frac{1}{2}\text{lb.} = 1.14375\text{t.}$, $\$8 \times 1.14375 =$
 $\$9.15$, Ans.
31. $35\text{gal. } 3\text{qt. } 1\text{pt.} = 35.875\text{gal.}$; $\$7.175 \div 35.875 =$
 $\$0.20$, Ans.
32. $12.5 \div 3.125 = 4$, i. e., the pole is 4 times as long as
the shadow; $\therefore$ the steeple is $33.28125\text{ft.} \times 4 =$
 133.125ft. , Ans.
33. $16.5 \times 15 = 247.5$, area in sq. ft. of floor.
 $247.5 \div 9 = 27.5$, " " sq. yd. "
 $\$1.25 \times 27.5 = \$34.375$, Ans.

UNITED STATES MONEY.

(ART. 186, p. 147.)

4.	48300c. ; 483000m.		6.	1876m.
5.	684c. ; 6840m.			

(ART. 187, p. 147.)

9.	\$876.94		10.	\$76.843
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ADDITION.

(ART. 188, p. 147.)

2.	\$1953.294		5.	\$33.50
3.	\$60829.18			

SUBTRACTION.

2.	\$16.44		5.	\$2208.50
3.	\$42.117			

MULTIPLICATION.

2.	\$8978821.875		5.	\$15581.25
3.	\$1618781.598			

DIVISION.

3. \$201.35

PRACTICAL EXAMPLES.

(ART. 189, p. 149.)

3.	\$156.25	19.	\$120
4.	\$69.75	26.	\$6
5.	\$2812.50	27.	\$9
9.	\$8.50	28.	\$25
10.	\$54.75	29.	\$20
13.	81	30.	\$204
14.	45	34.	\$40.125
15.	25	35.	\$1187.55
38.	\$7.50		
	$\$2.35 \times 5 =$		
	$\$11.75$		
	$\$19.25$		
	$\$19.25 \div \$5.50 = 3.5,$		
	Ans.		

MISCELLANEOUS EXAMPLES IN U. S. MONEY.

(p. 156.)

1. $56c. \times 3\frac{1}{2} = \$1.96, \text{ Ans.}$
2. $\$7.62\frac{1}{2} \times 3 = \$22.87\frac{1}{2}, \text{ Ans.}$
3. $\$22.50 \div 4 = \$5.62\frac{1}{2}, \text{ Ans.}$
4. $\$16.87\frac{1}{2} \div 15 = \$1.12\frac{1}{2}, \text{ Ans.}$

$$5. \quad \$375.50 + \$487.75 = \$863.25; \$176.37 + \$346.83 = \$523.20; \$863.25 - \$523.20 = \$340.05, \text{ Ans.}$$

$$6. \quad \$9.50 \times 25 = \$237.50$$

$$\$9.25 \times 50 = \underline{\$462.50}$$

$$\$700.00$$

$$\$700 - \$650 = \$50 \text{ gain, Ans.}$$

$$7. \quad 75c. \times 87\frac{1}{2} = \$65.62\frac{1}{2}, \text{ Ans.}$$

$$8. \quad 28756m.$$

$$9. \quad 6180m.$$

$$10. \quad \$545.98$$

$$11. \quad \$47.689$$

$$12. \quad \$3725 - \$1862.75 = \$1862.25, \text{ Ans.}$$

$$13. \quad \$750 \times 3 = \$2250$$

$$\$500 \times 4 = \underline{\$2000}$$

$$\$4250, \text{ Ans.}$$

$$14. \quad \$16.50 + \$4.25 + \$5.75 + \$3.50 + \$4.37\frac{1}{2} + \$12.62\frac{1}{2} = \$47, \text{ Ans.}$$

$$15. \quad \$113.75 \div 7 = \$16.25, \text{ Ans.}$$

$$16. \quad \$68.75 \div \$6.25 = \$11, \text{ Ans.}$$

$$17. \quad \$3.75 \div \$0.625 = 6, \text{ Ans.}$$

$$18. \quad \$12.50 \times 8.725 = \$109.0625, \text{ Ans.}$$

$$19. \quad 8248lb. = 4.124t.; \$6 \times 4.124 = \$24.744, \text{ Ans.}$$

$$20. \quad 3a. 2r. 20rd. = 3.625a.; \$48 \times 3.625 = \$174, \text{ Ans.}$$

$$21. \quad 16\frac{3}{4}c. \times 12 = \$2; \$2 \div \$0.12\frac{1}{2} = 16, \text{ Ans.}$$

$$22. \quad \$4756.75 + \$4562.75 = \$9319.50; \$9319.50 - \$2468.50 = \$6851, \text{ Ans.}$$

$$23. \quad \$3.37\frac{1}{2} \div \$0.25 = 13.5m., \text{ Ans.}$$

$$24. \quad \$3.87\frac{1}{2} - \$3.37\frac{1}{2} = \$0.50; \$37.50 \div \$0.50 = 75, \text{ Ans.}$$

25. $\$3.875 - \$3.375 = \$0.50$, 1st Ans.
 $\$0.50 \times 100 = \$50$, 2d Ans.
26. $\$12.375 \times 20.5 = \$253.6875$, Ans.
27. $\$62.50 \times 67.75 = \$4234.375$, Ans.
28. $\$4234.375 \div 67.75 = \$62.50$, Ans.
29. $\$4234.375 \div \$62.50 = 67.75$, Ans.
30. $\$75 - \$62.50 = \$12.50$; $\$846.875 \div \$12.50 = 67.75$,
 Ans.
31. $\$62.50 \times 67.75 = \$4234.375$;
 $\$5081.25 - \$4234.375 = \$846.875$ gain, total; }
 $\$846.875 \div 67.75 = 12.50$ gain, per acre. } Ans.
32. $37\frac{1}{2}c. \times 356.25 = \$133.59$; $\$133.59 + \$62.50 =$
 $\$196.09$; $\$196.09 + \$37.50 = \$233.59$, Ans.
33. $14c. \times 14.75 = \$2.065$, Ans.
34. $\$11.75 \times 6.375 \times 7\frac{1}{2} = \$584.27$, Ans.
35. $13yd. 2qr. 3 na. = 54\frac{3}{4}qr. = 9\frac{1}{2}ells$ French; $\$4.67 \times$
 $9\frac{1}{2} = \$42.61\frac{3}{8}$, Ans.
- | | |
|--|--|
| <p>36. $\\$12.50$
 $87\frac{1}{2}c. \times 3 = 2.62\frac{1}{2}$
 $8\frac{1}{2}c. \times 24.5 = 2.08\frac{1}{2}$
 $37\frac{1}{2}c. \times 3 = 1.12\frac{1}{2}$
 $62\frac{1}{2}c. \times 2 = 1.25$
 $11c. \times 6 = .66$
 $4\frac{1}{2}c. \times 15 = .63\frac{3}{4}$
 $22c. \times 4 = .88$
 <u>Ans. $\\$21.76$</u></p> | <p>37. $3t. 15cwt. 2qr. 12\frac{1}{2}lb. =$
 $3.78125t.$; $\\$9.75 \times$
 $3.78125 = \\$36.867$,
 Ans.</p> |
|--|--|
38. $(20ft. + 15ft.) \times 2 = 70ft.$, distance round room;
 $70ft. \times 8.5 = 595ft.$, area of walls; $\frac{595 \times 125}{9 \times 5 \times 2}c. =$
 $\$8.26\frac{7}{18}$, Ans.

EXPLANATION. — Divide 595 by 9 to reduce to sq. yd., and then by 5, number of sq. yd. in one roll to find number of rolls; then multiply this quotient by $62\frac{1}{2}c.$, cost per roll.

$$39. \quad 33\text{yd.} + 50\text{yd.} = 83\text{yd.}; \quad 133.5\text{yd.} - 83\text{yd.} = 50.5\text{yd.}$$

$$\$3.33\frac{1}{3} \times 33 = \$110.$$

$$\$3.875 \times 50 = \$193.75$$

$$\$3.60 \times 50.5 = \$181.80$$

$$\underline{\$485.55}, \quad \text{Total receipts.}$$

$$\$3.25 \times 133.5 = \$433.875, \quad \text{Total cost.}$$

$$\underline{\$51.675}, \quad \text{Net gain, Ans.}$$

COMPOUND NUMBERS.

ADDITION.

(ART. 199, p. 159.)

- | | |
|---|--|
| 5. 27lb. 6oz. 7dwt. 11gr.
6. 30gal. 1pt. 2gi.
7. 21a. 2r. 37rd.
8. 25lb. 11oz. 6dr. 4gr.
9. 29bush. 2qt. 1pt. | 10. 18c. 6c.ft. 6cu.ft. 36c.in.
11. 21l.m.
12. 19t. 7cwt. 10lb. 2oz.
13. 15circ. 5s. 28° 39' 16".
14. 26yd. 3qr. 3na. 1in. |
|---|--|
18. 8m. 6fur. 8rd. 11½ft., or 8m. 6fur. 8rd. 11ft. 6in.
 19. 26t. 2cwt. 3qr. 19lb. 5oz.
 20. 27bush. 2pk. 3qt.
 21. 55yd. 3qr. 2na. 1½in.
 22. 174bush. 3qt. 1pt.
 23. 45t. 7cwt. 2qr. 18lb.
 24. 128a. 2r. 35rd. 15½yd. 7ft., or 128a. 2r. 35rd. 16yd. 36in.
 25. 19circ. 13° 56' 34".
 26. 161m. 7fur. 21rd. 3yd.
 27. 23t. 4cwt. 3qr. 10lb.

SUBTRACTION.

(ART. 201, p. 163.)

5. 9yd. 2qr. $1\frac{1}{2}$ in.
 6. 4l. 1fur. 32rd 2yd. 2ft. 3in.
 7. 4a. 2r. 26rd. 24yd. 4ft. 138in.
 8. 8gal. 2qt. 1pt. 1gi.
 10. 20c. 5c.ft. 10cu.ft. 1558c.in.
 11. 100bush. 1pk. 6qt.
 12. 1wk. 5d. 7h. 14m. 45sec.

	circ.	deg.	m.	fur.	rd.	yd.	ft.		circ.	deg.	m.	fur.	rd.	yd.	ft.		
16.	7	0	0	1	0	0	1	}	=	{	6	358	138	7	78	10	4
	2	27	69	3	39	5	2				2	27	69	3	39	5	2
								Ans. 4 331 69 4 39 5 2									

19. 6yr. 6m.
 20. 25yr. 8m. 8d.
 21. Variable.
 22. 70yr. 9m. 6d.
 23. 4yr. 2m. 3d.

24. 5yr. 8m. 8d.
 25. 8yr. 3m. 10d.
 26. 24yr. 5m. 29d.
 27. 17yr. 7m. 29d.

EXAMPLES IN ADDITION AND SUBTRACTION, p. 165.

1. Minuend,

bush.	pk.	qt.
150	3	4

50	2	0
----	---	---

27	1	4
----	---	---

Subtrahend,

77	3	4
----	---	---

Ans.

73	0	0
----	---	---

2.

m.	fur.	rd.
127	4	10

48	2	6
----	---	---

54	0	4
----	---	---

102	2	10
-----	---	----

Ans.

25	2	0
----	---	---

3.

a.	r.	rd.
47	3	25
25	2	15

Min.

73	2	0
----	---	---

Sub.

37	3	0
----	---	---

Ans.

35	3	0
----	---	---

4.	bush.	pk.	qt.	pt.
	8	3	2	1
	10	2	7	1
	Sum,	19	2	2 0
		54	1	3 1
		49	3	2 1
	Difference,	4	2	1 0
	Ans.	15	0	1 0
5.	rd.	yd.	ft.	in. b.c.
	5	1	2	4 1
	4	2	1	9 2
	Sum,	9	4	1 2 0
		10	5	2 7 2
		1	1	1 6 0
	Difference,	9	4	1 1 2
	Ans.	1		
6.	Min.	yd.	qr.	na. in.
		49	1	3 2
		15	3	1 1
		14	3	3 1
		14	2	3 2
	Sub.	45	2	0 1 $\frac{1}{2}$
	Ans.	3	3	3 $\frac{1}{4}$

7.	cwt.	qr.	lb.
	16	1	15
	6	1	10
			5 3 20
	Beef,	28	2 20
		4	3 18
		3	3 24
			Pork, 8 3 17
	Ans.	19	3 3
8.	gal.	qt.	pt. gl.
	63	3	1 3
	56	2	0 2
			Min. 120 2 0 1
	Sub.	75	2 1 3
			Ans. 44 3 0 2
9.	Min.	lb.	oz. dwt. gr.
		47	8 16 22
		7	0 8 14
		3	6 8 15
			Sub. 10 6 17 5
	Ans.	37	1 19 17

MULTIPLICATION.

(ART. 205, p. 167.)

- | | |
|-------------------------------|-------------------------------|
| 5. 17lb. 5oz. 1dr. 1sc. 10gr. | 9. 57circ. 2s. 25° 4' 10''. |
| 6. 30t. 5cwt. 3qr. 24lb. | 10. 107gal. 1 qt. |
| 12oz. | 11. 98bush. 3pk. 2qt. 1pt. |
| 7. 60yd. 2qr. 3na. | 12. 51c. 7c.ft. 15cu.ft. 1716 |
| 8. 3wk. 6d. 14h. 17m. 57sec. | cu.in. |

13. 32a. 2yd. 8ft. 140in.	27. 396£ 2s. 3d.
15. 16m. 5fur. 26rd. 4yd. 2in. 1b.c.	28. 725bush. 6qt. 1pt.
16. 68a. 2r. 27rd. 13yd. 2ft. 36in.	29. 314lb. 3oz. 4dr. 1sc. 14gr.
18. 20° 2' 40''.	31. 731yd. 1qr. 3na.
19. 52m. 5fur. 36rd. 1yd. 2in.	32. 1179gal. 3qt. 2gi.
20. 232m. 3fur. 25rd.	34. 35334bush. 3pk. 3qt. 1pt.
21. 27t. 16cwt. 1qr.	35. 10599m. 14rd. 4yd. 2ft. 5in.
22. 5£ 8s. 11d. 1qr.	36. 339° 43' 30''
23. 86gal. 3qt. 2gi.	37. 8468gal. 1 pt. 2gi.
24. 79m. 7fur. 1ch. 1rd. 1li. $\frac{1}{2}$ in.	41. 49m. 44sec.
25. 31circ. 4s. 17° 45' 45''.	42. 7h. 59m. 40sec.
	43. 6h.

DIVISION.

(ART. 209, p. 173.)

4. 4lb. 6oz. 8dwt. 20gr.	13. 8a. 6ft. 107in.
5. 2lb. 10oz. 6dr. 2sc. 15gr.	14. 4t. 3cwt. 2qr. 14lb. 8oz. 4 dr.
6. 3t. 15cwt. 2qr. 24lb. 15oz. 8dr.	15. 11a. 3r. 35rd. 21yd. 4ft. 108in.
7. 6yd. 2qr. 3na. 2in.	17. 4gal. 3qt. 1pt. 3gi.
8. 1wk. 2d. 4h. 45m. 59sec.	18. 2t. 3cwt. 2qr. 15lb.
9. 5circ. 8s. 20° 30' 25''.	19. 5cwt. 3qr. 20lb.
10. 8gal. 3qt. 1pt. 2gi.	20. 15bush. 3pk. 6qt. 1pt.
11. 8bush. 3pk. 7qt. 1pt.	21. 30m. 2fur. 20rd. 5yd.
12. 12c. 7c.ft. 15cu.ft. 1725 cu.in.	22. 9£ 12s. 6d. 3qr.

$$11. \quad 18\text{ft. } 6' \times 6\text{ft. } 8' \div 32 = 3\text{c. } 6\text{c.ft. } 13\frac{1}{2}\text{cu.ft.}, \text{ Ans.}$$

NOTE.—This Ex. may be solved by multiplying the length, breadth, and height together, and dividing the product by 128, but wood for market is usually cut 4 feet in length, and, consequently, we may find the number of cords in a pile of such wood by multiplying the length of the pile by its height and dividing the product by 32, as above.

$$12. \quad 18\text{ft. } \times 16\text{ft. } 6' \div 9 = 33, \text{ Ans.}$$

$$13. \quad 3\text{ft. } 6' 4'' \times 8\text{ft. } 9' 6'' = 31\text{ft. } 0' 2'' 2''', \text{ Ans.}$$

(ART. 220, p. 181.)

$$4. \quad 197\text{ft. } 1' 8'' \div 15\text{ft. } 8' = 28388'' \div 2256'' = 12\frac{7}{12}, \text{ i. e. } 12\text{ft. } 7', \text{ Ans.}$$

$$5. \quad 89\text{ft. } 4' \div 2\text{ft. } 8' = 1072' \div 32' = 33\frac{1}{2}, \text{ i. e. } 33\text{ft. } 6', \text{ Ans.}$$

MISCELLANEOUS EXAMPLES IN COMPOUND NUMBERS.
p. 181.

$$1. \quad 152\text{bush. } 3\text{pk. } 3\text{qt. } 1\text{pt. } \div 9 \times 7 = 118\text{bush. } 3\text{pk. } 4\text{qt. } 1\text{pt.}, \text{ Ans.}$$

$$2. \quad 30\text{m. } 3\text{fur. } 25\text{rd. } 5\text{yd. } + 33\text{m. } 4\text{fur. } 20\text{rd. } 4\text{yd. } = 64\text{m. } 0\text{fur. } 6\text{rd. } 3\frac{1}{2}\text{yd.}; 207\text{m. } 4\text{fur. } 25\text{rd. } 1\text{yd. } - 64\text{m. } 0\text{fur. } 6\text{rd. } 3\frac{1}{2}\text{yd.} = 143\text{m. } 4\text{fur. } 18\text{rd. } 3\text{yd.}; 143\text{m. } 4\text{fur. } 18\text{rd. } 3\text{yd. } \div 4 = 35\text{m. } 7\text{fur. } 4\text{rd. } 3\text{yd. } 1\text{ft. } 6\text{in.}, \text{ Ans.}$$

$$3. \quad 3\text{£ } 15\text{s. } 6\text{d. } 1\text{qr. } \times 857 \div 157 = 20\text{£ } 12\text{s. } 2\text{d. } 3\frac{6}{157}\text{qr.}, \text{ Ans.}$$

$$4. \quad 12\text{ft. } 8' \times 10' \times 9 = 95\text{ft.}; 95\text{ft. } \div 15 = 6\text{ft. } 4\text{in.}, \text{ Ans.}$$

$$5. \quad 62\text{lb. } 8\text{oz. } \times 2\frac{1}{2} = 156.25\text{lb.}; 12\text{ft. } \times 1\text{ft. } 8' \times 9' = 15\text{ft. } 156.25\text{lb. } \times 15 = 2343.75\text{lb.}, \text{ Ans.}$$

- 6.
- | | wk. | d. | h. | m. | sec. |
|-------------|-----|----|----|----|------|
| | 3 | 6 | 16 | 20 | 18 |
| | 2 | 3 | 18 | 50 | 40 |
| Sum, | 6 | 3 | 11 | 10 | 58 |
| | 6 | 5 | 8 | 25 | 30 |
| | 5 | 2 | 22 | 18 | 15 |
| Difference, | 1 | 2 | 10 | 7 | 15 |
| Ans. | 5 | 1 | 1 | 3 | 43 |
7. $4^{\circ} 44' + 76^{\circ} 43' = 81^{\circ} 27'$; $81^{\circ} 27' \times 4 = 5\text{h.}25\text{m.}48\text{sec.}$, Ans.
8. $8\text{h. } 10\text{m. } 16\frac{1}{3}\text{sec.} \div 4 = 122^{\circ} 34' 13''$, Dif. in longitude; $122^{\circ} 34' 13'' - 6^{\circ} 7' 13'' = 116^{\circ} 27'$ east, Ans.
9. 146d. 17h. 10m. 5sec.
10. 3cwt. 2qr. 18lb. = 368lb.; $368\text{lb.} \div 2 = 184\text{lb.}$
- | | |
|--------------------------------------|----------------|
| 8c. $\times 184 =$ | \$14.72 |
| $9\frac{1}{2}\text{c.} \times 184 =$ | \$17.02 |
| | <u>\$31.74</u> |
| $8\frac{1}{2}\text{c.} \times 368 =$ | \$31.28 |
| Ans. | \$0.46 |
11. 24lb. 6oz. 12dwt. 20gr. = 141428gr.; $141428\text{gr.} \div 7000 = 20\text{lb. } 3\text{oz. } 4\frac{2}{5}\text{dr.}$, Ans. (See Art. 96, Note 2.)
12. $90^{\circ} = 324000''$; $1' 3'' = 63''$; $324000'' \div 63'' = 5142\frac{2}{3}\text{m.}$ = 3d. 13h. $42\frac{2}{3}\text{m.}$, Ans.
13. $24\text{m. } 3\text{fur. } 20\text{rd.} \times 75 = 1832\text{m. } 6\text{fur. } 20\text{rd.}$; $2760\text{m.} - 1832\text{m. } 6\text{fur. } 20\text{rd.} = 927\text{m. } 1\text{fur. } 20\text{rd.}$, Ans.
14. $24\text{m. } 3\text{fur. } 10\text{rd.} - 15\text{m. } 6\text{fur. } 20\text{rd.} = 8\text{m. } 4\text{fur. } 30\text{rd.}$, distance apart at end of 1 day; $8\text{m. } 4\text{fur. } 30\text{rd.} \times 5 = 42\text{m. } 7\text{fur. } 30\text{rd.}$, Ans.
15. $18\text{s. } 9\text{d. } 3\text{qr.} \times 260 = 244\text{£ } 11\text{s. } 3\text{d.}$, Flour.
 $1\text{£ } 15\text{s. } 6\text{d.} \times 125 = 221\text{£ } 17\text{s. } 6\text{d.}$, Cloth.
 Ans. $22\text{£ } 13\text{s. } 9\text{d.}$, Gain.

16.	5 8'	17.	5 6'
	4 11'		4 9'
	<u>22 8'</u>		<u>22 0'</u>
	5 2' 4''		4 1' 6''
Top,	27 10' 4''		26 1' 6''
	2		2
Top and bottom,	<u>55 8' 8''</u>		<u>52 3' 0''</u>
	5 8'		5 6'
	3 8'		3 6'
	<u>17 0'</u>		<u>16 6'</u>
	3 9' 4''		2 9' 0''
One side,	20 9' 4''		19 3'
	2		2
Two sides,	41 6' 8''		38 6'
	4 9'		4 7'
	3 8'		3 6'
	<u>14 3'</u>		<u>13 9'</u>
	3 2' 0''		2 3' 6''
One end,	17 5'		16 0' 6''
	2		2
Two ends,	34 10'		32 1' 0''
Top and bottom,	55 8' 8''		52 3'
Two sides,	41 6' 8''		38 6'
Two ends,	34 10' 0''		32 1'
One box,	132 1' 4''		122 10'
	12		12
Ans.	1585 4' 0''		1474 0'
	1474 0'		
	<u>111 4'</u>		
	Ans. to Ex. 17.		

18. $1474\text{ft} \div 12 = 122\text{ft. } 10', \text{ Ans.}$

EXPLANATION.—Divide the number of feet of boards required to make the smaller set of boxes by 12, because 12 feet of boards make a cubic foot. See explanation of Ex. 78, p. 53 of the Key.

19. $44\text{m. } 4\text{fur.} = 2819520\text{in.}; 9\text{ft. } 8\text{in.} = 116\text{in.}; 2819520 \div 116 = 24306\frac{6}{8}, \text{ Ans.}$

20. $4\text{ft. } 6\text{in.} \times 3\text{ft. } 8\text{in.} \times 3\text{ft. } 9\text{in.} = 106920\text{cu.in.}; 106920 \div 231 = 462\frac{4}{7}, \text{ Ans. (See Art. 106.)}$

21. $5\text{h. } 30\text{m.} = 330\text{m.}; 330\text{m.} \div 50 = 6\frac{3}{5}\text{m.}, \text{ Ans.}$

22. $\$75 \times 60 \times 12 = \$54000, \text{ amount in 1 day}; \$1000000 \div \$54000 = 18\frac{1}{2}\frac{4}{7}, \text{ No. days,} = 18\text{d. } 6\text{h. } 13\text{m. } 20\text{sec.}, \text{ Ans.}$

23. $75\text{lb.} = 432000\text{gr.}; 432000\text{gr.} \div 7000 = 61\frac{4}{7}\text{lb.} = 61\text{lb. } 11\text{oz. } 6\frac{4}{7}\text{dr.}, \text{ Ans. (See Art. 96, Note 2.)}$

PERCENTAGE.

(ART. 225, p. 184.)

2. .08, .12, .165, .25, .72. 3. $\frac{1}{5}, \frac{1}{3}, \frac{3}{4}.$

(ART. 226, p. 185.)

4. $\$250 \times .08 = \$20, \text{ Ans.}$

9. $900 \times .33\frac{1}{3} = 300, \text{ Ans.}$

10. $56 \times .14\frac{2}{7} = 8, \text{ Ans.}$

11. $27 \times .66\frac{2}{3} = 18; 27 - 18 = 9, \text{ Ans.}$

12. $18775 \times .08 = 1502; 18775 + 1502 = 20277, \text{ Ans.}$

13. $1376875 \times .12 = 165225; 1376875 - 165225 = 1211650, \text{ Ans.}$

INTEREST.

(ART. 232, p. 189.)

- | | | | |
|-----|---------------------|-----|----------|
| 6. | \$257 $\frac{1}{8}$ | 23. | \$43.509 |
| 7. | \$287 | 24. | \$47.438 |
| 8. | \$656 $\frac{1}{8}$ | 25. | \$19.64 |
| 9. | \$175 $\frac{5}{8}$ | 26. | \$12.129 |
| 10. | \$100 $\frac{1}{2}$ | 27. | \$14.915 |
| 15. | \$61 | 28. | \$47.504 |
| 16. | \$78.40 | | |
-
- | | | | | |
|-----|----------|------|-------|---|
| 29. | yr. 1854 | m. 2 | d. 11 | |
| | 1851 | 6 | 7 | $\$125 \times .160\frac{2}{3} = \$20.083, \text{Ans.}$ |
| | 2 | 8 | 4 | |
| 30. | 1855 | 1 | 26 | |
| | 1852 | 4 | 18 | $\$154.25 \times .166\frac{1}{3} = \$25.657, \text{Ans.}$ |
| | 2 | 9 | 8 | |
| 31. | 1856 | 9 | 9 | |
| | 1854 | 8 | 7 | $\$172 \times .125\frac{1}{3} = \$21.557, \text{Ans.}$ |
| | 2 | 1 | 2 | |
| 32. | 1857 | 1 | 30 | |
| | 1855 | 11 | 12 | $\$254 \times .073 = \$18.542, \text{Ans.}$ |
| | 1 | 2 | 18 | |
| 33. | 1841 | 5 | 2 | |
| | 1836 | 11 | 13 | $\$132.25 \times .268\frac{1}{3} = \$35.465, \text{Ans.}$ |
| | 4 | 5 | 19 | |
| 34. | 1842 | 6 | 21 | |
| | 1841 | 3 | 26 | $\$100 \times .074\frac{1}{3} = \$7.417, \text{Ans.}$ |
| | 1 | 2 | 25 | |
35. 56£ 10s. 6d. 3qr. = 56.528£; $56.528£ \times .94 = 53.13632£ = 5£ 6s. 3d. 1qr., \text{Ans.}$

36. $246\text{£ } 18\text{s. } 9\text{d. } 1\text{qr.} = 246.939\text{£}; 246.939\text{£} \times .137\frac{1}{2} = 33.954112\text{£} = 33\text{£ } 19\text{s. } 1\text{d.}, \text{Ans.}$
37. $125\text{£ } 16\text{s. } 8\text{d. } 2\text{qr.} = 125.835\text{£}; 125.835\text{£} \times .082\frac{1}{2} = 10.339442\text{£} = 10\text{£ } 6\text{s. } 9\text{d. } 2\text{qr.}, \text{Ans.}$
40. $\$256.84 \times .077\frac{1}{2} = \$19.9051$, interest at 6 per cent.;
 $\$19.9051 \div 6 = \$3.31752$; $\$3.31752 \times 9 = \$29.858$,
 Ans.
41. $24\text{£ } 6\text{s. } 8\text{d. } 1\text{qr.} = 24.334\text{£}; 24.334\text{£} \times .167 = 4.063778\text{£}$, interest at 6 per cent.; $4.063778\text{£} \div 6 = .677296\text{£}$; $.677296 \times 5 = 3.38648\text{£} = 3\text{£ } 7\text{s. } 8\text{d. } 3\text{qr.}, \text{Ans.}$
42. $150.5\text{£} \times .141 = 21.2205\text{£}; 21.2205\text{£} \div 6 = 3.53675\text{£}$;
 $3.53675\text{£} \times 4\frac{1}{2} = 15.91537\text{£} = 15\text{£ } 18\text{s. } 3\text{d. } 3\text{qr.}, \text{Ans.}$
44. $\$224.48 \times .152\frac{1}{2} = \$34.233$; $\$224.48 + \$34.233 = \$258.713$, Ans.
- | | | | |
|-----|------------|-----|------------------|
| 45. | \\$52.68 | 49. | \\$213.438 |
| 46. | \\$393.192 | 50. | 94£ 9s. 5d. 1qr. |
| 48. | \\$36.348 | | |
54. $\$167.42$ Principal. [6d.
 11.05 Int. from Apr. 15, '58, to May 21, '59; 1yr. 1m.

 178.47 Amount of Principal to May 21, '59.
 42 18 1st Payment.

 136.29 1st Remainder, forming the 2d Principal. [18d.
 10.631 Int. from May 21, '59, to Sept. 9, '60; 1yr. 3m.

 146.921 Amount of 2d Principal to Sept. 9, '60.
 54.41 Sum of 2d and 3d Payments.

 92.511 2d Remainder, forming 3d Principal.
 2.128 Int. from Sept. 9, '60, to Jan. 27, '61; 4m. 18d.

 94.639 Amount of 3d Principal to Jan. 27, '61.
 27.47 4th Payment.

 67.169 3d Remainder, forming 4th Principal. [18d.
 4.903 Int. from Jan. 27, '61, to Apr. 15, '62; 1yr. 2m.

 \\$72.072 Amount due Apr. 15, 1862, Ans.

53.	yr.	m.	d.		
	1863	4	24	NOTE. — This is a	\$486.96
	1862	12	6	convenient manner	.042
	1862	8	18	of solving examples	97392
	1861	12	6	in partial payments.	194784
	1861	1	24	<i>Every figure made</i>	20.45232
	1860	5	12	<i>in solving the exam-</i>	486.96
		8	12	<i>ple is preserved, and</i>	507.412
		10	12	<i>the work may be ex-</i>	154.87
		8	12	<i>amined at any stage</i>	352.542
		3	18	<i>of the operation. In</i>	.052
		4	18	<i>finding the several</i>	705084
				<i>times, the minuend</i>	1762710
				<i>for the first subtrac-</i>	18.332184
				<i>tion is the subtra-</i>	352.542
				<i>hend for the second,</i>	370.874
					75.18
					295.694
					.042
					591388
					1182776
					12.419148
					295.694.
					308.113
					124.87
					183.243
					.018
					1465944
					183243
					3.298374
					183.243
					186.541
					100.
					86.541
					.023
					259623
					173082
					1.990413
					86.541
					\$88.531, Ans.

(55.)

\$472.76 Principal.

11.583 Int. from Dec. 4, '60, to Apr. 10, '61; 4m. 6d.484.343 Amount of Principal to Apr. 10, '61.125.843 1st Payment.358.500 1st Remainder, forming 2d Principal.15.894 Int. from Apr. 10, '61, to Nov. 28, '61; 7m. 18d.374.394 Amount of 2d Principal to Nov. 28, '61.133.724 2d Payment.240.670 2d Remainder, forming 3d Principal.6.411 Int. from Nov. 28, '61, to Apr. 15, '62; 4m. 17d.247.081 Amount of 3d Principal to Apr. 15, '62.223.081 3d Payment.24.000 3d Remainder, forming 4th Principal..97 Int. from Apr. 15, '62, to Nov. 13, '62; 6m. 28d.\$24.97 Amount due Nov. 13, 1862, Ans.

NOTE. — From the nature of the example, interest commences Dec. 4, 1860, six months after the date of the note.

(56.)

\$1500 Principal.

58.75 Int. from Aug. 6, '58, to Apr. 1, '59; 7m. 25d.1558.75 Amount of Principal to Apr. 1, 1859.58.75 1st Payment.1500. 1st Remainder, forming 2d Principal.45. Int. from Apr. 1, '59, to Oct. 1, '59; 6m.1545. Amount of 2d Principal to Oct. 1, 1859.145. 2d Payment.1400. 2d Remainder, forming 3d Principal.7. Int. from Oct. 1, '59, to Nov. 1, '59; 1m.1407. Amount of 3d Principal to Nov. 1, 1859.150. 3d Payment.1257. 3d Remainder, forming 4th Principal.

[Carried forward.]

(56. Continued.)

18.855	Int. from Nov. 1, '59, to Feb. 1, '60; 3 m.
<u>1275.855</u>	Amount of 4th Principal to Feb. 1, 1860.
100.	4th Payment.
<u>1175.855</u>	4th Remainder, forming 5th Principal.
11.759	Int. from Feb. 1, '60, to Apr. 1, '60; 2m.
<u>1187.614</u>	Amount of 5th Principal to Apr. 1, 1860.
137.614	5th Payment.
<u>1050.</u>	5th Remainder, forming 6th Principal.
15.75	Int. from Apr. 1, '60, to July 1, '60; 3m.
<u>\$1065.75</u>	Amount due July 1, 1860, Ans.

(58.)

Principal,	\$2500
Int. of Principal for 11m. 8d.,	140.833
Amount of Principal,	<u>\$2640.833</u>
1st Payment,	\$562.50
Int. of 1st Payment from Sept. 4, 8m. 8d.,	23.25
2d Payment,	846.37
Int. of 2d Payment from Dec. 24, 4m. 18d.,	19.467
3d Payment,	362.63
Int. of 3d Payment from Feb. 18, 2m. 24d.,	5.077
Sum of Payments, with their Interest,	<u>1819.294</u>
Sum due May 12, 1862, Ans.,	<u>\$821.539</u>

(60.)

Amount of Principal to May 25, '60, 1yr.,	\$725.04
1st Payment,	\$100.
Int. of 1st Pay't to May 25, '60, 11m. 24d.,	<u>5.90</u>
1st Payment with Interest,	105.90
1st Remainder or 2d Principal,	<u>619.14</u>
Int. of 2d Principal to May 25, '61, 1 yr.,	37.148
Amount of 2d Principal to May 25, '61,	<u>656.288</u>

(Carried over.)

(60. Continued.)

2d Payment,	\$100.	
Int. of 2d Pay't to May 25, '61, 10m. 18d.,	5.30	
3d Payment,	75.	
Int. of 3d Pay't to May 25, '61, 7m. 12d.,	2.775	
4th Payment,	50.	
Int. of 4th Pay't to May 25, '61, 5m. 6d.,	1.30	
Sum of 2d, 3d, and 4th Pay'ts with Int.,		234.375
2d Remainder or 3d Principal,		421.913
Int. of 3d Principal to May 25, '62, 1yr.,		25.315
Amount of 3d Principal to May 25, '62,		447.228
5th Payment,	\$100.	
Int. of 5th Pay't to May 25, '62, 11m. 18d.,	5.80	
6th Payment,	40.	
Int. of 6th Pay't to May 25, '62, 9m. 12d.,	1.88	
Sum of 5th and 6th Pay'ts, with Int.,		147.68
3d Remainder or 4th Principal,		299.548
Int. of 4th Principal to July 15, '62, 1m. 20d.,		2.496
Sum due at settlement, July 15, 1862, Ans.,		\$302.044

71. $\$4.12 = \text{Int. for } \underline{2\text{m.}}$

$8.24 = \text{Int. for } \underline{4\text{m.}} = 2 \text{ times } 2\text{m.}$

$\underline{2.06} = \text{Int. for } \underline{1\text{m.}} = \frac{1}{2} \text{ of } 2\text{m.}$

$\$10.30 = \text{Int. for } 5\text{m., Ans.}$

72. $\$.42 = \text{Int. for } 2\text{m.}$

$.14 = \text{Int. for } 20\text{d.} = \frac{1}{3} \text{ of } 2\text{m.}$

$\underline{.014} = \text{Int. for } \underline{2\text{d.}} = \frac{1}{10} \text{ of } 20\text{d.}$

$\$.574 = \text{Int. for } 2\text{m. } 22\text{d., Ans.}$

73. $\$.54 = \text{Int. for } \underline{2\text{m.}}$

$.18 = \text{Int. for } 20\text{d.} = \frac{1}{3} \text{ of } 2\text{m.}$

$\underline{.018} = \text{Int. for } \underline{2\text{d.}} = \frac{1}{10} \text{ of } 20\text{d.}$

$\$.198 = \text{Int. for } 22\text{d., Ans.}$

74. $\$21.48 = \text{Int. for 2m.}$
 $10.74 = \text{Int. for 1m.} = \frac{1}{2} \text{ of 2m.}$
 $3.58 = \text{Int. for } 10\text{d.} = \frac{1}{3} \text{ of 1m.}$
 $\$35.80 = \text{Int. for 3m. } 10\text{d., Ans.}$
75. $\$7.50 = \text{Int. for 1yr. 8m., i. e. for 20m.}$
 $.75 = \text{Int. for } \frac{1}{16} \text{ of 20m., i. e. } 2\text{m.}$
 $.075 = \text{Int. for } \frac{1}{16} \text{ of 2m. i. e. } 6\text{d.}$
 $\$8.325 = \text{Int. for } 22\text{m. } 6\text{d., Ans.}$
76. $\$17.30 = \text{Int. for 1yr. 8m., Ans.}$
79. $\$462.84, \text{ Principal.}$
 $.42 = \text{Simple Int. of } \$1 \text{ for 7 years.}$
 $194.393 = \text{Simple Int. of } \$462.84 \text{ for 7 years.}$
 $.221 = \text{Simple Int. of } \$1 \text{ for 3yr. 8m. 6d., i. e.}$
 $\frac{1}{2} \text{ 1yr. 8m. 6d.}$
 $42.961 = \text{Excess of Annual over Simple Int. of}$
 $\$462.84 \text{ for 7yr. 8m. 6d.}$
 $213.369 = \text{Simple Int. of Principal for 7yr. 8m. 6d.}$
 $\$256.330 = \text{Annual Int. of } \$462.84 \text{ for 7yr. 8m. 6d., Ans.}$
80. $\$250, \text{ Principal.}$
 $.30 = \text{Simple Int. of } \$1 \text{ for 5 years.}$
 $75.00 = \text{Simple Int. of } \$250 \text{ for 5 years.}$
 $.159 = \text{Simple Int. of } \$1 \text{ for 2yr. 7m. 24d., i. e.}$
 $\frac{5}{2} \text{ 1} = 2\text{yr.}$
 $\$11.925 = \text{Excess of Annual over Simple Int., Ans.}$
81. $\$325, \text{ Principal.}$
 $.48 = \text{Simple Int. of } \$1 \text{ for 8 years.}$
 $156. = \text{Simple Int. of } \$325 \text{ for 8 years.}$
 $.242\frac{1}{2} = \text{Simple Int. of } \$1 \text{ for 4yr. 15d.}$
 $37.830 = \text{Excess of Annual over Simple Int.}$
 $166.563 = \text{Simple Int. of Principal.}$
 $204.393 = \text{Annual Int.}$
 $325. \text{ Principal.}$
 $\$529.393 = \text{Amount, Ans.}$

82. $\$4692.80$ Principal.
 $\underline{2534.112} =$ Simple Int. of Principal for 9 years.
 $669.006 =$ Excess of annual over simple Int. for 9yr.
 4m. 24d.
 $2646.739 =$ Simple Int. of Principal.
 $3315.745 =$ Annual Int.
 4692.80 Principal.
 $\$8008.545 =$ Amount, Ans.

(ART. 246, p. 203.)

2. $\$142 \times .03 = \$4.26$; $\$21.30 \div \$4.26 = 5$, Ans.
 3. $\$36 \times .03 = \$1.08$; $\$7.56 \div \$1.08 = 7$, Ans.
 4. $\$300 \times .02 = \$6.00$; $\$43.80 \div \$6 = 7.3$, Ans.

(ART. 247, p. 204.)

2. $\$254 \times .05 = \$12.70$; $\$44.45 \div \$12.70 = 3.5\text{yr.} =$
 3yr. 6m., Ans.
 3. $\$75 \times .08 = \$6.00$; $\$15.80 \div \$6 = 2.63\frac{1}{3}\text{yr.} = 2\text{yr.}$
 7m. 18d., Ans.
 4. $\$200 \times .06 = \$12.00$; $\$236 - \$200 = \$36$; $\$36 \div$
 $\$12 = 3\text{yr.}$, Ans.
 5. $\$72 \times .08\frac{1}{2} = \$6.12$; $\$87.30 - \$72 = \$15.30$; $\$15.30$
 $\div \$6.12 = 2.5\text{yr.} = 2\text{yr. 6m.}$, Ans.
 6. $\$1000 \times .09 = \$90.00$; $\$247.50 \div \$90 = 2.75\text{yr.} =$
 2yr. 9m., Ans.
 8. $100 \div 8 = 12.5\text{yr.} = 12\text{yr. 6m.}$, Ans.
 9. $100 \div 6 = 16.66\frac{2}{3}\text{yr.} = 16\text{yr. 8m.}$, Ans.
 10. Assume $\$100$; in what time will $\$100$ gain $\$200$? $\$100$
 $\times .05 = \$5.00$; $\$200 \div \$5 = 40\text{yr.}$, Ans.

(ART. 248, p. 205.)

2. $\$13 \div .04 = \$325$, Ans.
 3. $\$150 \div .04 = \$3750$, Ans.
 4. $\$2000 \div .06 = \$33333.333$, Ans.

(ART. 248a, p. 205.)

2. $\$130.39 \div 1.04 = \$125.375$, Ans.
 3. $\$74.40 \div 1.24 = \$60$, Ans.
 4. $\$240 \div 1.20 = \$200$, Principal; $\$200 \times .20 = \$40$,
 Ans.

COMPOUND INTEREST.

(ART. 250, p. 207.)

2. $\$200$ NOTE. — Multiplying by 1.04 is, in
 1.04 effect, the same as multiplying by .04
 800 and *adding* the principal.
 200
 208.00
 1.04
 832
 208
 216.32
 1.026 $\frac{2}{3}$ Amount of \$1 for 8m.
 14421
 129792
 43264
 21632
 222.08853
 200. 1st Principal.
 \$22.089, Ans.

$$\begin{array}{r}
 3. \quad \$500 \\
 \quad \quad 1.07 \\
 \quad \quad \hline
 \quad \quad 3500 \\
 \quad \quad 500 \\
 \quad \quad \hline
 \quad \quad 535.00 \\
 \quad \quad 1.07 \\
 \quad \quad \hline
 \quad \quad 3745 \\
 \quad \quad 535 \\
 \quad \quad \hline
 \quad \quad 572.45 \\
 \quad \quad 1.07 \\
 \quad \quad \hline
 \quad \quad 400715 \\
 \quad \quad 57245 \\
 \quad \quad \hline
 \quad \quad 612.5215 \\
 \quad \quad 500. \\
 \quad \quad \hline
 \quad \$112.5215, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 4. \quad \$5000 \\
 \quad \quad 1.06 \\
 \quad \quad \hline
 \quad \quad 30000 \\
 \quad \quad 5000 \\
 \quad \quad \hline
 \quad \quad 5300.00 \\
 \quad \quad 1.06 \\
 \quad \quad \hline
 \quad \quad 31800 \\
 \quad \quad 5300 \\
 \quad \quad \hline
 \quad \quad 5618.00 \\
 \quad \quad 1.06 \\
 \quad \quad \hline
 \quad \quad 33708 \\
 \quad \quad 5618 \\
 \quad \quad \hline
 \quad \quad 5955.08 \\
 \quad \quad 1.06 \\
 \quad \quad \hline
 \quad \quad 3573048
 \end{array}$$

$$\begin{array}{r}
 595508 \\
 \hline
 6312.385 \quad [10m. 12d. \\
 1.052 \text{ Amount of } \$1 \text{ for}
 \end{array}$$

$$\begin{array}{r}
 5. \quad \$3000 \\
 \quad \quad 1.06 \\
 \quad \quad \hline
 \quad \quad 18000 \\
 \quad \quad 3000 \\
 \quad \quad \hline
 \quad \quad 3180.00 \\
 \quad \quad 1.06 \\
 \quad \quad \hline
 \quad \quad 19080 \\
 \quad \quad 3180 \\
 \quad \quad \hline
 \quad \quad 3370.80 \\
 \quad \quad 1.033 \text{ Amount of } \$1 \text{ for 6m. 18d.} \\
 \quad \quad \hline
 \quad \quad 101124 \\
 \quad \quad 101124 \\
 \quad \quad \hline
 \quad \quad 33708 \\
 \quad \quad \hline
 \quad \$3482.036, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 12624770 \\
 31561925 \\
 \hline
 6312385 \\
 \hline
 \$6640.629, \text{ Ans.}
 \end{array}$$

6. \$10000
 1.06

 60000
 10000

 10600.00
 1.06

 63600
 10600

 11236.00
 1.033 Amount of \$1 for 6m. 18d.

 33708
 33708

 11236
 11606.788
 10000.

 \$1606.788, Ans.

7. \$10000
 1.04

 40000
 10000

 10400.00
 1.04

 41600
 10400

 10816.00
 .033 Int. at 6 per cent.

 32448
 32448

 6)356.928
 59.488

 4

 237.952
 10816.

 11053.952
 10000.

 \$1053.952, Ans.

8. \$10000

1.08

80000

10000

10800.00

1.08

86400

10800

11664.00

.033 Int. at 6 per cent.

34992

34992

6) 384.912

64.152

8

513.216

11664.

12177.216

10000.

\$2177.216, Ans.

9. \$250

Amount of \$1 for 6m. = 1.03

750

250

257.50

1.03

7725

2575

265.225

1.03

795675

265225

273.182

1.03

819546

273182

281.377

1.03

844131

281377

\$289.818, Ans.

10.	\$36	11.	\$864.75
Am't of \$1 for 3m. =	1.02		1.06
	<u>36.72</u>		<u>518850</u>
	1.02		86475
	<u>7344</u>		<u>916.635</u>
	3672		1.06
	<u>37.454</u>		<u>5499810</u>
	1.02		916635
	<u>74908</u>		<u>971.633</u>
	37454		1.06
	<u>38.203</u>		<u>5829798</u>
	1.02		971633
	<u>76406</u>	1029.931	[8m. 15d.
	38203	1.042½	Amount of \$1 for
	<u>38.967</u>	514966	
	1.02	<u>2059862</u>	
	<u>77934</u>	4119724	
	38967	<u>1029931</u>	
	<u>39.746</u>	1073.703	
	1.02	<u>864.75</u>	
	<u>79492</u>	\$208.953, Ans.	
	39746		
	<u>40.541</u>		
	1.02		
	<u>81082</u>		
	40541		
	<u>41.352</u>		
	36.		
	<u>\$5.352, Ans.</u>		

12. $\begin{array}{r} \$327.54 \\ 1.06 \\ \hline 196524 \\ 32754 \\ \hline 347.192 \\ 1.06 \\ \hline 2083152 \\ 347192 \\ 368.024 \\ 1.06 \\ \hline 2208144 \\ 368024 \\ 390.105 \\ 1.06 \\ \hline 2340630 \\ 390105 \\ 413.511 \\ 1.021\frac{1}{2} \\ \hline 137837 \\ 413511 \\ 827022 \\ 413511 \\ \hline 422.333 \\ 327.54 \\ \hline \$94.793, \text{ Ans.} \end{array}$
16. $\begin{array}{r} \text{[per cent. for 18yr.]} \\ \$3.996019 = \text{Amount of \$1 at 8} \\ 350.50 \\ \hline 199800950 \\ 19980095 \\ 11988057 \\ \hline \$1400.605, \text{ Ans.} \end{array}$
17. $\begin{array}{r} \text{[cent. for 20yr.]} \\ \$3.660957 = \text{Int. of \$1 at 8 per} \\ 75 \\ \hline 18304785 \\ 25626699 \\ \hline \$274.572, \text{ Ans.} \end{array}$
18. $\begin{array}{r} \text{Int. of \$1 at 4 per ct. for 19yr.,} \\ \$1.106849 \left\{ \begin{array}{l} \text{or at 8 per cent. for 9yr. 6m.,} \\ \text{compounding semi-annually.} \end{array} \right. \\ 500 \\ \hline \$553.424500, \text{ Ans.} \end{array}$
19. $\begin{array}{r} \$3.869684 = \text{Am't of \$1 at 7 per cent. for 20yr.} \\ 3.869684 \\ \hline 15478736 \\ 30957472 \\ 23218104 \\ 34827156 \\ 23218104 \\ 30957472 \\ 11609052 \\ \hline \$14.97445 = \text{Amount of \$1 at 7 per cent. for 40yr.} \\ 100 \\ \hline \$1497.445, \text{ Ans.} \end{array}$

NOTE. — Find the amount of \$1 for 20 years, then of this amount for 20 more; then of any sum of money as before.

20. $\$3.207135 =$ Amount of \$1 at 6 per cent. for 20yr.

1.790848

25657080

12828540

25657080

28864215

22449945

3208135

$\$5.74349 =$ Amount of \$1 at 6 per cent. for 30yr.

100

$\$574.349$, Ans.

DISCOUNT.

(ART. 253, p. 209.)

2. $\$100 \div 1.06 = \$94.339+$; $\$100 - \$94.339 =$
 $\$5.661-$, Ans.

3. $\$1319.29 \div 1.175 = \$1122.80$, Ans.

4. $\$141.50 \div 1.0775 = \$131.32+$, Ans.

5. $\$346.87 \div 1.142 = \$303.74-$, Ans.

6. $\$456.25 \div 1.047 = \$435.77$; $\$456.25 - \$435.77 =$
 $\$20.48$, Ans.

7. $\$490.50 \div 1.09 = \$450$, 1st Ans.; $\$490.50 - \$450$
 $= \$40.50$, 2d Ans.

8. $\$315 \div 1.05 = \$300$; $\$315 - \$300 = \$15$, Ans.

9. $\begin{array}{r} 1863 \ 5 \ 1 \\ 1862 \ 8 \ 19 \\ \hline 8 \ 12 \end{array}$ $\$1000 \div 1.07 = \$934.58$; $\$1000 -$
 $\$934.58 = \$65.42$, Ans.

$$10. \quad \$350 \div 1.03 = \$339.806; \$350 - \$339.806 = \$10.194, \\ \text{Ans.}$$

$$11. \quad \$756 \div 1.06 = \$713.208; \$756 - \$713.208 = \$42.792, \\ \text{Ans.}$$

$$12. \quad \begin{array}{r} 1863 \quad 6 \quad 21 \\ 1863 \quad 5 \quad 12 \\ \hline \quad \quad 1 \quad 9 \end{array} \quad \$436 \div 1.008\frac{2}{3} = \$432.253, \text{ Ans.}$$

$$13. \quad \$896 \div 1.10 = \$814.545; \$896 - \$814.545 = \$81.455, \\ \text{Ans.}$$

$$14. \quad \$475 \div 1.142 = \$415.936, \text{ Ans.}$$

BANK DISCOUNT.

(ART. 253b, p. 213.)

$$3. \quad \begin{array}{l} \$86.46 = \text{Interest for 2m.} \\ 172.92 = \text{Interest for 4m.} \\ 4.323 = \text{Interest for 3d.} \\ \hline \$177.243 = \text{Discount.} \\ \$8646 - \$177.243 = \$8468.757, \text{ Proceeds, } \end{array} \left. \vphantom{\begin{array}{l} \$86.46 \\ 172.92 \\ 4.323 \\ \$177.243 \\ \$8646 \end{array}} \right\} \text{Ans.}$$

$$4. \quad \begin{array}{l} \$18.42 = \text{Interest for 60 days at 6 per cent.} \\ 9.21 = \text{Interest for 30 days.} \\ .921 = \text{Interest for 3 days.} \\ \hline 6)28.551 \\ \quad 4.758 \\ \quad \quad 7 \end{array}$$

$$\begin{array}{l} \$33.806, \text{ Discount.} \\ \$1842 - \$33.806 = \$1808.694, \text{ Proceeds. } \end{array} \left. \vphantom{\begin{array}{l} \$33.806 \\ \$1842 \end{array}} \right\} \text{Ans.}$$

$$5. \quad \begin{array}{l} \$4.89 = \text{Interest for 2m. at 6 per cent.} \\ 14.67 = \text{Interest for 6m.} \\ .2445 = \text{Interest for 3d.} \\ \hline 6)14.9145 \\ \quad 2.4858 \\ \quad \quad 5 \end{array}$$

$$\begin{array}{l} \$12.4290, \text{ Discount.} \\ \$489 - \$12.429 = \$476.571, \text{ Proceeds, } \end{array} \left. \vphantom{\begin{array}{l} \$12.4290 \\ \$489 \end{array}} \right\} \text{Ans.}$$

6.

m.	d.
6	27
4	12
2	15

 $\$6.29 = \text{Interest for 2m.}$
 $1.5725 = \text{Interest for 15d.}$
 $.3145 = \text{Interest for 3d.}$
 $\$8.1770 \text{ Discount.}$
 $\$629 - \$8.177 = \$620.823, \text{ Proceeds, } \left. \vphantom{\$629} \right\} \text{Ans.}$
7. $\$46.00 = \text{Interest for 2m.}$
 $184.00 = \text{Interest for 8m.}$
 $2.30 = \text{Interest for 3d.}$
 $\$186.30 = \text{Bank discount.}$
 $\$4600 \div 1.0405 = \$4420.951, \text{ Present worth;}$
 $\$4600 - \$4420.951 = \$179.049, \text{ Discount;}$
 $\$186.30 - \$179.049 = \$7.251, \text{ Ans.}$
9. The amount of $\$6844$ for 4m. 3d. is $\$6984.302$, and the interest of $\$6984.302$ for 3m. 3d. is $\$108.257$, which taken from $\$6984.302$, leaves $\$6876.045$, Ans.
10. $\$75 \times .05 = \$3.75$; $\$75 - \$3.75 = \$71.25$, Ans.
11. $\$250 \times .08 = \$20$; $\$250 - \$20 = \$230$, Ans.

(ART. 253c, p. 214.)

2.

	\$1.0000
Interest of \$1 for 3m. 3d.,	<u>.0155</u>
Proceeds of \$1,	.9845

 $\$300 \div .9845 = \$304.723, \text{ Ans.}$
3.

	\$1.0000
Interest of \$1 for 63d.,	<u>.0105</u>
Proceeds of \$1,	.9895

 $\$593.70 \div .9895 = \$600, \text{ Ans.}$

4. \$1.000
 Int. of \$1 for 93d. at 7 per cent., $\frac{.01875}{2}$
 Proceeds of \$1, $\frac{.981125}{2}$
 $\$1200 \div .981125 = \$1222.099$, Ans.
-

INSURANCE.

(ART. 258, p. 215.)

2. $\$75000 \times .03 = \$2250.00$, Ans.
 3. $\$2400 \times \frac{2}{3} = \$1600$; $\$1600 \times .01\frac{1}{4} = \$28$, Ans.
 4. $\$2000 \times .00\frac{2}{3} = \$12$; $\$12 + \$1.25 = \$13.25$, Ans.
 5. $\$8000 \times \frac{3}{4} = \$6000$, Amount insured.
 $\$6000 \times .00\frac{2}{3} = \$40$, Premium.
 $\$8000 - \$6000 + \$40 = \$2040$, My loss. }
 $\$6000 - \$40 = \$5960$, Loss of Co. } Ans.
 6. $\$75000 \times .015 = \$1125$, Ans.
 7. $\$25000 + \$35000 = \$60000$; $\$60000 \div 2 = \$30000$;
 $\$30000 \times .03 = \$900$, Ans.
 8. $\$6000 \times .0097 = \$58.20$, Ans.
 9. $\$8500 \times .0109 = \$92.65$, Ans.
-

STOCKS.

(ART. 264, p. 218.)

3. $\$1400 \times .30 = \$420$, Ans.
 4. $\$500 \times 5 = \$2500$; $\$2500 \times .10 = \$250$, Ans.

(ART. 265, p. 218.)

3. $\$109 \times 12 = \$1308$, Ans.
 4. $\$15 \times 75 = \$1125$, Ans.
 5. $\$18$ (premium on 1 share) $\times 15$ (number of shares)
 $= \$270$, Ans.

2. $\$638.40 \div \$1.14 = 560 = \$560$, Ans.
3. $\$1.12\frac{1}{2} \times 2500 = \$2812.50$, Ans.

(ART. 266, p. 219.)

3. $\$1000 \div \$125 = 8$, Ans.
4. $\$2200 \div \$88 = 25$, Ans.

1. $\$1.14\frac{1}{2} \times 5000 = \$5725$.
2. $\$13625 \div 1.09 = \$12500$.
3. $\$1.00 \div \$1.20 = .833 = \$0.83\frac{1}{3}$, Ans.
4. $\$1150$ currency buys $\$1000$ in U. S. 5-20's. The interest on $\$1000$ in U. S. 5.20's = $\$60$ gold, or $\$69$ currency. $\$69$, interest on $\$1150 = 6\%$, the rate of interest on the 1st investment, or the same as on the 2d investment. As gold is at par with currency at the redemption of the 5-20 bonds, only $\$1000$ would be received for what cost $\$1150$, and the second would be the better investment by $\$150$, Ans.

COMMISSION AND BROKERAGE.

(ART. 268, p. 220.)

2. $\$1892 \times .02 = \$37.84$, Ans.
3. $\$15000 \times .005 = \$75$, Ans.
4. $\$2124 \times .00\frac{1}{4} = \$5.31$, Ans.
5. $25c. \times 30 \times 50 \times 6 = \$2250$, Cost; $\$2250 \times .00\frac{3}{4} = \$13.50$, Ans.
6. $\$1.50 \times 400 = \$600$
 $\$.75 \times 400 = \$300$
 $\$1. \times 500 = \underline{\$500}$
 $\$1400$
 $\$1400 \times .03 = \$42$, 1st Ans.
 $\$1400 - \$42 = \$1358$, 2d Ans.

(ART. 269, p. 221.)

2. $\$10000 \div 1.005 = \$9950.25$ —, Investment, } Ans.
 $\$10000 - \$9950.25 = \$49.75$ +, Commission, }
3. $\$40100 \div \$1.0025 = \$40000$, Investment, } Ans.
 $\$40100 - \$40000 = \$100$, Commission, }
4. $\$5000 \times .05 = \$250$, Commission on the sale.
 $\$5000 - \$250 = \$4750$, Due employer.
 $\$4750 \div 1.03 = \$4611.65$, Invested in goods.
 $\$4750 - \$4611.65 = \$138.35$, Commission on purchase.

TAXES.

(ART. 275, p. 223.)

2	B's tax.	E's tax.	
On \$3000	= \$150.	On \$1000	= \$50.
On \$800	= 40.	On \$500	= 25.
On \$40	= 2.	On \$80	= 4.
On \$6	= 0.30	On \$6	= 0.30
On polls, $\$1.50 \times 2$	= 3.	On polls, $\$1.50 \times 3$	= 4.50
Total	= \$195.30	Total	= \$83.80
C's tax.	F's tax.		
On \$6000	= \$300.	On \$5000	= \$250.
On \$700	= 35.	On \$400	= 20.
On \$9	= 0.45	On \$80	= 4.00
Total	= \$335.45	On polls, $\$1.50 \times 3$	= 4.50
D's tax.	Total	Total	= \$278.50
On \$8000	= \$400.		
On \$400	= 20.		
On \$90	= 4.50		
On \$1	= 0.05		
On 1 poll,	= 1.50		
Total	= \$426.05		

CUSTOM HOUSE BUSINESS.

(ART. 281, p. 226.)

2. $10c. \times 4796 = \$479.60$; $\$479.60 \times .25 = \$119.90$, Ans.
 3. $\$5765 \times .36 = \$2075.40$, Ans.
 4. $\$13248 \times .33\frac{1}{3} = \$4416$, Ans.
-

(ART. 283, p. 227.)

2. $200 \times 500 = 100000$, No. lb. in 500 bags.
 $100000 \times .02 = \underline{2000}$, Allowance for tare.
 98000, No. lb. net.
 $98000 \times .04 = 3920$; $\therefore$ duty = \$3920, Ans.
3. $112 \times 300 = 33600$, No. lb. in 300 boxes.
 $(1 + 15) \times 300 = \underline{4800}$, Allowance for draft and tare.
 28800, No. lb. net.
 $28800 \times .06 = 1728$; $\therefore$ duty = \$1728, Ans.
4. $66 \times 48 = 3168$, No. lb. in 48 chests.
 $1 \times 48 = \underline{48}$, Allowance for draft.
 3120,
 $3120 \times .04 = \underline{124.80}$, Allowance for tare.
 2995.20, No. lb. net.
 $2995.20 \times .15 = 449.28$; $\therefore$ duty = \$449.28, Ans.
5. $56 \times 800 = 44800$, No. lb. in 800 bags.
 $1 \times (44800 \div 112) = \underline{400}$, Allowance for draft.
 44400
 $44400 \times .05 = \underline{2220}$, Allowance for tare.
 42180, No. lb. net.
 $42180 \times .05 = 2109$; $\therefore$ duty = \$2109, Ans.

EXCHANGE.

(ART. 296, p. 230.)

3. $\$8325 \times .98 = \$8158.50$, Ans.
 4. $\$7850 \times 1.01 = \$7928.50$, Ans.
 6. $\$4.83 \times 800 = \$3864$, 1st Ans.
 $\$3864 \times 1.10 = \$4250.40$, 2d Ans.
 7. $\$4.85 \times 1200 = \$5820$. [per cent.
 $\frac{116.40}{\$5820} =$ Freight and insurance at 2
 $\$5936.40 =$ Cost by buying sovereigns.
 $\$4.86\frac{1}{2} \times 1200 = \$5838.00 =$ Cost bills of exchange.
 $\$5936.40 - \$5838 = \$98.40$, Saved by buying bill of
 exchange, Ans.

(ART. 297, p. 232.)

3. $\$1 - 3 \text{ per cent.} = \$.97$, cost of $\$1$.
 $\$5820 \div .97 = \$6000$, Ans.
 4. $\$4168.30 \div 4.87\frac{1}{4} = 855\text{£ } 9\text{s. } 4\text{d.}$, Ans.

EQUATION OF PAYMENTS.

(ART. 299, p. 234.)

2. The interest of $\$4550$ for 4m. = $\$91$
 " " $\$5075$ " 8m. = $\$203$
 " " $\$3500$ " 12m. = $\$210$
 Sum of debts = $\$13125$ $\$504 =$ total int.
 $\$504 \div \$65.625 = 7.68$ No. months = 7m. 20d., 1st
 Ans. July 6, 1861 + 7m. 20d. = Feb. 26, 1862,
 2d Ans.

$$\begin{array}{r}
 3. \quad 1500 \times 4 = 6000 \\
 2100 \times 8 = 16800 \\
 2400 \times 12 = 28800 \\
 \hline
 6000 \qquad \qquad)51600 \\
 \qquad \qquad \qquad 8.6 = 8\text{m. } 18\text{d.}, \text{ Ans.}
 \end{array}$$

(ART. 300, p. 236.)

$$\begin{array}{r}
 3. \quad \begin{array}{ll} 0\text{m. May } 12, 1862, \$400 & \$0.80, \text{ Int. for } 12\text{d.} \\ 1\text{m. June } 4, \text{ " } 150 & .85, \text{ " } 1\text{m. } 4\text{d.} \\ 3\text{m. Aug. } 6, \text{ " } 80 & 1.28, \text{ " } 3\text{m. } 6\text{d.} \\ 6\text{m. Nov. } 24, \text{ " } 170 & 5.78, \text{ " } 6\text{m. } 24\text{d.} \end{array} \\
 \qquad \qquad \qquad 2)100) \$800 \quad \$8.71 \\
 \qquad \qquad \qquad \qquad \qquad 4)8.71 \\
 \qquad \qquad \qquad \qquad \qquad \qquad 2.18\text{m.} = 2\text{m. } 5\text{d.}
 \end{array}$$

 $\therefore$ Average date of purchase, July 5, 1862.

Equated time of payment, Jan. 5, 1863, Ans.

$$\begin{array}{r}
 4. \quad \begin{array}{ll} 0\text{m. Feb. } 17, 1862, \$1200 & \$3.40, \text{ Int. for } 17\text{d.} \\ 1\text{m. Mar. } 25, \text{ " } 472 & 4.327, \text{ " } 1\text{m. } 25\text{d.} \\ 1\text{m. " } 30, \text{ " } 468 & 4.68, \text{ " } 1\text{m. } 30\text{d.} \\ 5\text{m. July } 21, \text{ " } 500 & 14.25, \text{ " } 5\text{m. } 21\text{d.} \end{array} \\
 \qquad \qquad \qquad 2)100) \$2640 \quad \$26.657 \\
 \qquad \qquad \qquad \qquad \qquad 13.2)26.657 \\
 \qquad \qquad \qquad \qquad \qquad \qquad 2.02\text{m.} = 2\text{m. } 1\text{d.}
 \end{array}$$

 $\therefore$ Average date of purchase, April 1, 1862.

Equated time of payment, Aug. 1, 1862, Ans.

$$\begin{array}{r}
 5. \quad \begin{array}{ll} 0\text{m. Jan. } 8, & \$12 \quad \$0.016, \text{ Int. for } 8\text{d.} \\ 0\text{m. " } 24, & 20 \quad .08, \text{ " } 24\text{d.} \\ 3\text{m. Apr. } 18, & 1200 \quad 21.60, \text{ " } 3\text{m. } 18\text{d.} \\ 5\text{m. June } 6, & 4000 \quad 104.00, \text{ " } 5\text{m. } 6\text{d.} \end{array} \\
 \qquad \qquad \qquad 2)100) \$5232 \quad \$125.696 \\
 \qquad \qquad \qquad \qquad \qquad 26.16)125.696 \\
 \qquad \qquad \qquad \qquad \qquad \qquad 4.8\text{m.} = 4\text{m. } 24\text{d.}
 \end{array}$$

1st Ans. May 24; 2d Ans. Nov. 24.

6.	0m. Jan. 8,	\$4000	\$5.333, Int. for 8d.
	0m. " 24,	1200	4.80, " 24d.
	3m. Apr. 18,	20	.36, " 3m. 18d.
	5m. June 6,	12	.312, " 5m. 6d.
		2)100)\$5232	\$10.805
		25.16)	10.805

.41m. = 12d.

1st Ans. Jan. 12; 2d Ans. July 12.

(ART. 301, p. 237.)

2.	0m. Jan. 18, 8m.	\$2000	\$86., Int. for 8m. 18d.
	1m. Feb. 21, 6m.	3000	115.50, " 7m. 21d.
	5m. June 6, 2m.	600	21.60, " 7m. 6d.
		2)100)\$5600	\$223.10
		28)	223.10

7.97m. = 7m. 29d.

Aug. 29, Ans.

(ART. 302, p. 240.)

Dr.

3.	2m. Apr. 24, 6m.	\$356	\$15.664, Int. for 8m. 24d.
	4m. June 18, 4m.	875	37.625, " 8m. 18d.
	5m. July 3, 6m.	433	24.032, " 11m. 3d.
		\$1664	\$77.321

Cr.

	0m. Feb. 6, 4m.	\$530	\$11.130, Int. for 4m. 6d.
	3m. May 27, 6m.	652	32.274, " 9m. 27d.
	5m. July 15,	300	8.25, " 5m. 15d.
		\$1482	\$51.654

\$1664 \$77.321

\$1482 \$51.654

2)100)\$182 \$25.667

.91)25.667

28.206m. = 28m. 6d.

Now, 28m. 6d. from Feb. 1, 1862, gives June 6, 1864,
 1st Ans. $\$182 - \$10.92$ (Int. for 1yr.) = $\$171.08$,
 2d Ans.

Dr.

4.	0m. Mar. 14, 4m.	\$452	\$10.095, Int. for 4m. 14d.
	2m. May 8,	1224	13.872, " 2m. 8d.
	2m. " 20, 8m.	150	8.00, " 10m. 20d.
	2m. " 27, 6m.	2496	111.072, " 8m. 27d.
	3m. June 19, 3m.	5724	189.846, " 6m. 19d.
	4m. July 30, 6m.	88	4.84, " 10m. 30d.
		<u>\$10134</u>	<u>\$337.725</u>

Cr.

1m. Apr. 13,	\$500	\$3.583, Int. for 1m. 13d.
2m. May 21, 4m.	1000	33.50, " 6m. 21d.
5m. Aug. 18,	192	5.376, " 5m. 18d.
6m. Sept. 11,	5420	172.537, " 6m. 11d.
	<u>\$7112</u>	<u>\$214.996</u>

$\$10134$ $\$337.725$

$\$7112$ $\$214.996$

2)100) $\$3022$ $\$122.729$

15.11) 122.729

8.12m. = 8m. 4d.

Now, 8m. 4d. from Mar. 1, 1862, gives Nov. 4, 1862,
 1st Ans. $\$3022 - \$15.11$ (Int. for 1m.) = $\$3006.89$,
 2d Ans.

Dr.

5.	^{1861.} 2m. Nov. 18, 4m.	\$800	\$26.40, Int. for 6m. 18d.
	^{1862.} 7m. Apr. 6, 2m.	350	16.10, " 9m. 6d.
	7m. " 30,	125	5.00, " 7m. 30d.
	8m. May 15, 4m.	1200	75.00, " 12m. 15d.
	13m. Oct. 12, 2m.	200	15.40, " 15m. 12d.
		<u>\$2675</u>	<u>\$137.90</u>

	Cr.	
^{1861.} 0m. Sept. 27,	\$1200	\$5.40, Int. for 27d.
3m. Dec. 12, 4m.	800	29.60, " 7m. 12d.
^{1862.} 8m. May 15, 4m.	850	53.125, " 12m. 15d.
10m. July 18,	625	33.125, " 10m. 18d.
	<u>\$3475</u>	<u>\$121.250</u>
	\$3475	\$137.90
	<u>\$2675</u>	<u>\$121.25</u>
2)100)	\$800	\$16.65
	<u>4)16.65</u>	
	4.162m. = 4m. 5d.	

Now, 4m. 5d. from Sept. 1, 1861, reckoned *backward*, since the greater interest arises on the smaller side, gives April 25, 1861, 1st Ans. $\$800 + \$74.40$ (Int. for 1yr. 6m. 18d.) = $\$874.40$, 2d Ans.

7. 6m. from Sept. 27, 1860, gives Mar. 27, 1861, Ans.

PROFIT AND LOSS.

(ART. 304, p. 242.)

- $\$7 \times 16 = \$112$, sum received;
 $\$100$, sum paid;
 $16) \$12$, total gain;
 $\$.75$, gain per bbl., } Ans.
- $24 \times \frac{1}{3} = 8$; $24 - 8 = 16$.
 $\$6.75 \times 8 = \$54.00$
 $\$7.50 \times 16 = \$120$.
 $\$174.00$, sum received;
 $\$168.00$, sum paid;
 $\$6.00$, gain, Ans.

$$\begin{array}{r}
 3. \quad 3\text{cwt. } 2\text{qr. } 18\text{lb.} = 368\text{lb.}; \$36.80, \text{ sum paid;} \\
 \quad 8\frac{1}{2}\text{c.} \times 368 = \$30.66\frac{2}{3}, \text{ sum received;} \\
 \quad \quad 368) \overline{\$6.13\frac{1}{3}}, \text{ total loss;} \\
 \quad \quad \quad \underline{\$0.1\frac{2}{3}}, \text{ loss per lb.,} \quad \left. \vphantom{\begin{array}{l} 368) \overline{\$6.13\frac{1}{3}} \\ \underline{\$0.1\frac{2}{3}} \end{array}} \right\} \text{Ans.}
 \end{array}$$

$$\begin{array}{r}
 4. \quad \$3 \times 164 = \$492. \\
 \quad \$2.25 \times 287 = \$645.75 \\
 \quad \quad \underline{\$1137.75}, \text{ sum received;} \\
 \quad \quad \underline{\$1107.00}, \text{ sum paid;} \\
 \quad \quad \quad \underline{\$30.75}, \text{ gain, Ans.}
 \end{array}$$

(ART. 305, p. 243.)

$$\begin{array}{r}
 2 \quad \quad \quad \$20, \text{ sum paid;} \text{ or } \$3.00 \div \$20 = .15 \text{ Ans.} \\
 34\text{c.} \times 50 = \underline{\$17}, \text{ sum received;} \\
 \quad \quad \underline{\$3}, \text{ total loss.}
 \end{array}$$

$$\frac{3}{20} = .15, \text{ Ans.}$$

$$\begin{array}{r}
 3. \quad \$5 - \$4 = \$1; \frac{1}{4} = .25, \text{ Ans. Or } \$1.00 \div \$4.00 \\
 \quad \quad = .25, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 4. \quad \$5 - \$4 = \$1; \frac{1}{5} = .20, \text{ Ans. Or } \$1.00 \div \$5.00 \\
 \quad \quad = .20, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 5. \quad \$2000 \times .06 = \$120, \text{ Int. on } \$2000 \text{ for 1yr.;} \\
 \quad \quad \quad 95, \text{ cost of storage;} \quad \text{Or } \$2000 + \\
 \quad \quad \quad \underline{2000}, \text{ 1st cost;} \quad \quad \$120 + \$95 = \\
 \quad \quad \underline{\$2215}, \text{ total cost;} \quad \quad \$2215 - \$2155 = \\
 \quad \quad \underline{\$2155}, \text{ sum received;} \quad = \$60. \quad \$60 \\
 \quad \quad \quad \underline{\$60}, \text{ total loss.} \quad \quad \div \$2000 = .03, \\
 \frac{60}{2000} = .03, \text{ Ans.} \quad \quad \text{Ans.}
 \end{array}$$

(ART. 306, p. 244.)

$$\begin{array}{r}
 3. \quad \$4848 \times .05 = \$242.40; \$4848 + \$242.40 = \$5090.40, \\
 \quad \quad \text{Ans.}
 \end{array}$$

$$4. \quad 12\text{c.} \times .10 = 1\frac{1}{2}\text{c.}; 12\text{c.} + 1\frac{1}{2}\text{c.} = 13\frac{1}{2}\text{c.}, \text{ Ans.}$$

$$\begin{array}{r}
 5. \quad \$3500 + \$750 = \$4250; \$4250 \times .15 = \$637.50; \\
 \quad \quad \underline{\$4250 - \$637.50} = \$3612.50, \text{ Ans.}
 \end{array}$$

(ART. 307, p. 245.)

3. $\$26.88 \div 6 = \$4.48$, price per yard.
 $\$4.48 \div 1\frac{1}{2} = \$4$, Ans.
4. $\$1090 \div 10 = \$109$, price of 1 share;
 $\$109 \times 1\frac{1}{9} = \$100$, Ans.
5. $\$2 \div 25 = 8c.$, price per lb.
 $8c. \times 1\frac{1}{8} = 10c.$, Ans.

(ART. 308, p. 246.)

3. $7\frac{1}{2} \times 112 = 116$; $116 - 100 = 16$, Ans.
4. $6\frac{1}{5} \times 96 = 104$; $104 - 100 = 4$, gain per cent., Ans.
5. $1\frac{1}{2} \times 105 = 90$; $100 - 90 = 10$, loss per cent., Ans.

(ART. 309, p. 247.)

4. $\$4 = \text{cost. } \$4 + \$0.50 = \$4.50$, selling price.
 $\begin{array}{r} .12\frac{1}{2} \\ \hline \end{array}$
 $\$0.50 = \text{gain. } 1\frac{1}{2} \times 4.50 = \$5$, marked price, Ans.
5. $\$8 = \text{cost. } \$8 + \$0.40 = \$8.40$, selling price.
 $\begin{array}{r} .05 \\ \hline \end{array}$
 $\$0.40 = \text{gain. } 1\frac{1}{4} \times \$8.40 = \$10$, marked price, Ans.

MISCELLANEOUS EXAMPLES IN PROFIT AND LOSS.

1. $48c. \times 37\frac{1}{2} = \$18$
 $56c. \times 37\frac{1}{2} = \$21$
 $\begin{array}{r} \$39 \quad \text{sum received;} \\ \$37.50, \text{ sum paid;} \\ \hline \$1.50, \text{ gain, Ans.} \end{array}$
2. $\$3.37\frac{1}{2} - \$3 = \$0.37\frac{1}{2}$; $\frac{37\frac{1}{2}}{300} = \frac{1}{8} = .12\frac{1}{2}$, Ans.

3. $\frac{100}{93\frac{1}{2}} \times \$7.50 = \$8$, cost; (Prob. 4.)
 $\$8 \times .12\frac{1}{2} = \$1$, gain; $\$8 + \$1 = \$9$, Ans. (Prob. 3.)
4. $\$3$, cost. $\$3 + \$0.60 = \$3.60$, selling price.
 $.20$
 $\$0.60$, gain. $\frac{100}{90} \times \$360 = \$4$, Ans.
5. $\$3$ cost;
 $\$2.50$, selling price;
 $\$0.50$, whole loss;
 $\frac{50}{300} = \frac{1}{6} = .16\frac{2}{3}$, Ans.
6. $\frac{100}{87\frac{1}{2}} \times \$42 = \$48$, Ans.
7. $\frac{2.12\frac{1}{2}}{2.00} \times 90 = 95.62\frac{1}{2} = 95\frac{5}{8}$; $100 - 95\frac{5}{8} = 4\frac{3}{8}$ per cent. lost, Ans.
8. $\$87.50 \times .12 = \$10.50$, gain; $\$87.50 + \$10.50 = \$98$.
 Ans.

PARTNERSHIP.

(ART. 312, p. 248.)

2. $\$4000$, A's stock; $\frac{4000}{15000} = \frac{4}{15}$, A's share of stock.
 5000 , B's stock; $\frac{5000}{15000} = \frac{1}{3}$, B's share of stock.
 6000 , C's stock; $\frac{6000}{15000} = \frac{2}{5}$, C's share of stock.
 $\$15000$, Total stock.
 $\$3000 \times \frac{4}{15} = \$800$, A's gain,
 $\$3000 \times \frac{1}{3} = \$1000$, B's gain,
 $\$3000 \times \frac{2}{5} = \$1200$, C's gain, } Ans. by Rule 1.
 $\$3000 \div \$15000 = .20$; i. e. the profits = 20 per cent. of the stock;
 $\therefore$ A's share of profits = $\$4000 \times .20 = \$800$,
 B's share of profits = $\$5000 \times .20 = \$1000$,
 C's share of profits = $\$6000 \times .20 = \$1200$, }
 Ans. by Rule 2.

3. $\frac{4}{15}$ of \$750 = \$200, A's; $\frac{1}{3}$ of \$750 = \$250, B's; $\frac{2}{5}$ of \$750 = \$300, C's, Ans.
4. \$6000 + \$10000 + \$8000 = \$24000, Total stock.
 $\frac{6000}{24000}$ or $\frac{1}{4}$ of \$4000 = \$1000, A's gain, }
 $\frac{10000}{24000}$ or $\frac{5}{12}$ of \$4000 = \$1666.66 $\frac{2}{3}$, B's gain, } Ans.
 $\frac{8000}{24000}$ or $\frac{1}{3}$ of \$4000 = \$1333.33 $\frac{1}{3}$, C's gain, }
5. \$3000 + \$1500 + \$3500 = \$8000, sum of debts.
 $\frac{3000}{8000}$ or $\frac{3}{8}$ of \$5000 = \$1875, A's share, }
 $\frac{1500}{8000}$ or $\frac{3}{16}$ of \$5000 = \$937.50, B's share, } Ans.
 $\frac{3500}{8000}$ or $\frac{7}{16}$ of \$5000 = \$2187.50, C's share, }
6. 2 + 3 + 5 = 10, total No. of equal parts.
 $\frac{2}{10}$ of \$1500 = \$300, A's part, }
 $\frac{3}{10}$ of \$1500 = \$450, B's part, } Ans.
 $\frac{5}{10}$ of \$1500 = \$750, C's part, }
7. 3 + 5 + 7 = 15;
 $\frac{3}{15}$ of \$90 = \$18, A's part, }
 $\frac{5}{15}$ of \$90 = \$30, B's part, } Ans.
 $\frac{7}{15}$ of \$90 = \$42, C's part, }
8. $4\frac{2}{3} + 7\frac{1}{3} = 12$;
 $\frac{4\frac{2}{3}}{12}$ or $\frac{7}{18}$ of \$12 = \$4.66 $\frac{2}{3}$, A's share, }
 $\frac{7\frac{1}{3}}{12}$ or $\frac{11}{18}$ of \$12 = \$7.33 $\frac{1}{3}$, B's share, } Ans.
9. \$3000 + \$5000 + \$7000 + \$11000 = \$26000, total cargo.
 $\frac{3000}{26000}$ or $\frac{3}{26}$ of \$5200 = \$600, A's share, }
 $\frac{5000}{26000}$ or $\frac{5}{26}$ of \$5200 = \$1000, B's share, } Ans.
 $\frac{7000}{26000}$ or $\frac{7}{26}$ of \$5200 = \$1400, C's share, }
 $\frac{11000}{26000}$ or $\frac{11}{26}$ of \$5200 = \$2200, D's share, }
10. A furnishes $\frac{3}{5}$ and B $\frac{2}{5}$ of the capital, $\therefore$ A must suffer $\frac{3}{5}$ and B $\frac{2}{5}$ of the loss, i. e. A \$180, B \$120, 1st Ans.
 $\$1200 \times \frac{2}{5} = \$480$, B's capital; $\$480 \div 160 = \$3$, 2d Ans.

(ART. 313, p. 250.)

2. $\$4000 \times 12 = \$48000$, A's stock.

$\$6000 \times 11 = \$66000$, B's stock.

$\$114000$, Total stock.

$$\frac{48000}{114000} \text{ or } \frac{8}{19} \text{ of } \$570 = \$240, \text{ A's loss, } \left. \begin{array}{l} \\ \end{array} \right\} \text{Ans.}$$

$$\frac{66000}{114000} \text{ or } \frac{11}{19} \text{ of } \$570 = \$330, \text{ B's loss, } \left. \begin{array}{l} \\ \end{array} \right\}$$

3. $\$600 \times 9 = \$5400$, A's stock.

$\$800 \times 8 = \$6400$, B's stock.

$\$1000 \times 12 = \$12000$, C's stock.

$\$23800$, Total stock.

$$\frac{5400}{23800} \text{ or } \frac{27}{119} \text{ of } \$1071 = \$243, \text{ A's gain, } \left. \begin{array}{l} \\ \end{array} \right\} \text{Ans.}$$

$$\frac{6400}{23800} \text{ or } \frac{32}{119} \text{ of } \$1071 = \$288, \text{ B's gain, } \left. \begin{array}{l} \\ \end{array} \right\}$$

$$\frac{12000}{23800} \text{ or } \frac{60}{119} \text{ of } \$1071 = \$540, \text{ C's gain, } \left. \begin{array}{l} \\ \end{array} \right\}$$

4. $3 \times 8 = 24$, A's stock.

$5 \times 6 = 30$, B's stock.

$6 \times 7 = 42$, C's stock.

96 , Total stock.

$$\frac{24}{96} \text{ or } \frac{1}{4} \text{ of } \$48 = \$12, \text{ A's share, } \left. \begin{array}{l} \\ \end{array} \right\} \text{Ans.}$$

$$\frac{30}{96} \text{ or } \frac{5}{16} \text{ of } \$48 = \$15, \text{ B's share, } \left. \begin{array}{l} \\ \end{array} \right\}$$

$$\frac{42}{96} \text{ or } \frac{7}{16} \text{ of } \$48 = \$21, \text{ C's share, } \left. \begin{array}{l} \\ \end{array} \right\}$$

5.	$\$3000 \times 4 = \$12000$	$\$4000 \times 4 = \$16000$
	$5000 \times 4 = 20000$	$3000 \times 4 = 12000$
	$2000 \times 4 = 8000$	$5000 \times 4 = 20000$
	$\$40000$	$\$48000$

$$\begin{array}{r} \text{C's stock.} \\ \$2000 \times 4 = \$8000 \\ 3000 \times 4 = 12000 \\ 5000 \times 4 = 20000 \\ \hline \$40000 \end{array}$$

$$\$40000 + \$48000 + \$40000 = \$128000, \text{ sum of products.}$$

$$\frac{40000}{128000} \text{ or } \frac{5}{16} \text{ of } \$6400 = \$2000, \text{ B's share, } \left. \begin{array}{l} \\ \end{array} \right\} \text{Ans}$$

$$\frac{48000}{128000} \text{ or } \frac{6}{16} \text{ of } \$6400 = \$2400, \text{ T's share, } \left. \begin{array}{l} \\ \end{array} \right\}$$

$$\frac{40000}{128000} \text{ or } \frac{5}{16} \text{ of } \$6400 = \$2000, \text{ C's share, } \left. \begin{array}{l} \\ \end{array} \right\}$$

EXPLANATION. — B has \$3000 in till May 1, 4 months; then he has \$5000 in till Sept. 1, 4 months; and, finally, he has \$2000 in for the remaining 4 months of the year; $\therefore \$3000 \times 4 + \$5000 \times 4 + \$2000 \times 4 = \$40000$, may be considered B's product. In a similar manner the products of T and C are found.

6. $\$3000 \times 24 = \$72000$, B's product.

$\$4000 \times 16 = \$64000$, H's product.

$\$2500 \times 6 = \$15000$, L's product.

$\$151000$, Sum of products.

$$\begin{array}{l} \frac{72000}{151000} \text{ or } \frac{72}{151} \text{ of } \$7550 = \$3600, \text{ B's share,} \\ \frac{64000}{151000} \text{ or } \frac{64}{151} \text{ of } \$7550 = \$3200, \text{ H's share,} \\ \frac{15000}{151000} \text{ or } \frac{15}{151} \text{ of } \$7550 = \$750, \text{ L's share,} \end{array} \left. \vphantom{\begin{array}{l} \frac{72000}{151000} \text{ or } \frac{72}{151} \text{ of } \$7550 = \$3600, \text{ B's share,} \\ \frac{64000}{151000} \text{ or } \frac{64}{151} \text{ of } \$7550 = \$3200, \text{ H's share,} \\ \frac{15000}{151000} \text{ or } \frac{15}{151} \text{ of } \$7550 = \$750, \text{ L's share,} \end{array}} \right\} \text{Ans.}$$

7. 5 cows = 3 oxen and 3 oxen = 2 horses, $\therefore$ 5 cows =

2 horses, and $\therefore$ 1 ox = $\frac{2}{3}$ horse and 1 cow = $\frac{2}{5}$ horse.

A's stock of 6 horses for 8 weeks = 1 horse for 48 wks.

B's stock of 12 oxen or 8 horses

for 10 weeks = 1 horse for 80 wks.

C's stock of 50 cows or 20 horses

for 12 weeks = 1 horse for 240 wks.

Total stock, 1 horse for 368 wks.

$$\begin{array}{l} \frac{48}{368} \text{ or } \frac{3}{23} \text{ of } \$92 = \$12, \text{ A's share,} \\ \frac{80}{368} \text{ or } \frac{5}{23} \text{ of } \$92 = \$20, \text{ B's share,} \\ \frac{240}{368} \text{ or } \frac{15}{23} \text{ of } \$92 = \$60, \text{ C's share,} \end{array} \left. \vphantom{\begin{array}{l} \frac{48}{368} \text{ or } \frac{3}{23} \text{ of } \$92 = \$12, \text{ A's share,} \\ \frac{80}{368} \text{ or } \frac{5}{23} \text{ of } \$92 = \$20, \text{ B's share,} \\ \frac{240}{368} \text{ or } \frac{15}{23} \text{ of } \$92 = \$60, \text{ C's share,} \end{array}} \right\} \text{Ans.}$$

8. A's stock, 10 oxen $\times$ 20 = 200

15 cows or 10 oxen $\times$ 14 = 140

99 sheep or 9 cows or 6 oxen $\times$ 26 = 156

A's stock equals 1 ox for 496 weeks.

B's stock, 7 oxen $\times$ 24 = 168

12 cows or 8 oxen $\times$ 20 = 160

66 sheep or 6 cows or 4 oxen $\times$ 25 = 100

B's stock equals 1 ox for 428 weeks.

C's stock, 25 oxen $\times$ 8 = 200

12 cows or 8 oxen $\times$ 12 = 96

33 sheep or 3 cows or 2 oxen $\times$ 15 = 30

C's stock equals 1 ox for 326 weeks.

$496 + 428 + 326 = 1250$ oxen for 1 week, total stock.

$\$300 \div 1250 = 24c.$, cost per week for 1 ox.

$24c. \times 2 = 48c.$; $48c. \div 3 = 16c.$, cost per wk. for 1 cow.

$16c. \div 11 = 1\frac{5}{11}c.$, cost per week for 1 sheep.

$1\frac{5}{11}c. \times 99 \times 26 = \$37.44$, what A pays for sheep;

$16c. \times 15 \times 14 = 33.60$, what A pays for cows;

$24c. \times 10 \times 20 = 48.00$, what A pays for oxen;

$\frac{428}{1250}$ of $\$300 = \$119.04$, A's share of expense.

$1\frac{5}{11}c. \times 66 \times 25 = \$24.00$, what B pays for sheep;

$16c. \times 12 \times 20 = 38.40$, what B pays for cows;

$24c. \times 7 \times 24 = 40.32$, what B pays for oxen;

$\frac{428}{1250}$ of $\$300 = \$102.72$, B's share of expense.

$1\frac{5}{11}c. \times 33 \times 15 = \$7.20$, what C pays for sheep.

$16c. \times 12 \times 12 = 23.04$, what C pays for cows.

$24c. \times 25 \times 8 = 48.00$, what C pays for oxen.

$\frac{326}{1250}$ of $\$300 = \$78.24$, C's share of expense.

9. J. Fox's $\$5000$ for 12 months = $\$60000$ for 1 month;

$\$60000 \div 8 = \$7500$, Ans.

EXPLANATION. — S. Low, to be entitled to an equal share of the profits, must have an equal amount of stock, i. e., $\$60000$ for 1 month; but as his stock is to be in 8 months, he must put in only $\frac{1}{8}$ of $\$60000 = \$7500$.

A's stock.	B's stock.
10. $\$3000 \times 2 = \$6000$	$\$3000 \times 5 = \$15000$
$4000 \times 6 = 24000$	$2500 \times 3 = 7500$
$2000 \times 4 = 8000$	$4000 \times 4 = 16000$
<u>$\\$38000$</u>	<u>$\\$38500$</u>

C's stock.
$\$3000 \times 5 = \$15000$
$3500 \times 3 = 10500$
$3000 \times 4 = 12000$
<u>$\\$37500$</u>

(Continued on page 108.)

$\$38000 + \$38500 + \$37500 = \$114000$, sum of products.

$$\begin{array}{l} \frac{38000}{114000} \text{ or } \frac{380}{1140} \text{ of } \$4000 = \$1333.33\frac{1}{3}, \text{ A's share,} \\ \frac{38500}{114000} \text{ or } \frac{385}{1140} \text{ of } \$4000 = \$1350.87\frac{1}{4}, \text{ B's share,} \\ \frac{37500}{114000} \text{ or } \frac{375}{1140} \text{ of } \$4000 = \$1315.78\frac{5}{7}, \text{ C's share,} \end{array} \left. \vphantom{\begin{array}{l} \frac{38000}{114000} \\ \frac{38500}{114000} \\ \frac{37500}{114000} \end{array}} \right\} \text{Ans.}$$

A's stock.	B's stock.
11. $\$1000 \times 3 = \$3000$	$\$1200 \times 3 = \$3600$
$1500 \times 4 = 6000$	$1500 \times 4 = 6000$
$700 \times 5 = 3500$	$2700 \times 5 = 13500$
<u>$\\$12500$</u>	<u>$\\$23100$</u>

C's stock.

$$\begin{array}{r} \$1800 \times 3 = \$5400 \\ 1400 \times 4 = 5600 \\ 900 \times 5 = 4500 \\ \hline \$15500 \end{array}$$

$\$12500 + \$23100 + \$15500 = \$51100$, sum of products.

$\$1000 + \$1200 + \$1800 = \$4000$, stock in at first;

$\$1500 + \$1500 + \$1400 = \$4400$, greatest stock in trade;

$\$700 + \$2700 + \$900 = \$4300$, stock in finally;

$\$4400 \times .10 = \$440$, total gain, 1st Ans.

$$\begin{array}{l} \frac{125}{511} \text{ of } \$440 = \$107.63\frac{1}{11}, \text{ A's share,} \\ \frac{231}{511} \text{ of } \$440 = \$198.90\frac{2}{11}, \text{ B's share,} \\ \frac{155}{511} \text{ of } \$440 = \$133.46\frac{1}{11}, \text{ C's share,} \end{array} \left. \vphantom{\begin{array}{l} \frac{125}{511} \\ \frac{231}{511} \\ \frac{155}{511} \end{array}} \right\} \text{2d and 3d Ans.}$$

EXAMPLES IN ANALYSIS.

(ART. 313a, p. 252.)

1. If 6 bbl. cost \$42, then 1 bbl. will cost $\frac{1}{6}$ of \$42, which is \$7; and if 1 bbl. cost \$7, then 11 bbl. will cost 11 times \$7, which is \$77, Ans.

2. $\frac{\$35 \times 8 \times 7}{5} = \$392$, Ans.

3. If 20 is $\frac{5}{8}$, 4 is $\frac{1}{2}$, and $\frac{9}{8} = 4 \times 9 = 36$, Ans.
4. $51 \div 17 = 3$; $3 \times 173 = 519$, Ans.
5. $95 \div 19 = 5$; $5 \times 23 = 115$, Ans.
6. $95s. \div 19 = 5s.$; $5s. \times 23 = 115s.$, Ans.
7. $\$74 \div 37 = \$2$; $\$2 \times 50 \times 5 = \$500$, Ans.
8. $64 \div 8 = 8$; $8 \times 9 = 72$; $72 \div 12 = 6$, Ans.
9. $72 \div 9 = 8$; $8 \times 5 = 40$; $40 \div 4 = 10$, Ans.
10. $\$63 \div 9 = \$7$; $\$7 \times 7 = \$49$, Ans.
11. $\frac{2}{5} + \frac{2}{5} = \frac{4}{5}$; $\frac{3}{5} - \frac{2}{5} = \frac{1}{5}$; $6 \div 6 = 1$; $1ft. \times 35 = 35ft.$, Ans.
12. $12 \times 7 = 84$; $84 \div 24 = 3\frac{1}{2}$, No. of months, Ans.
Or, twice the number of men gives half the time; $\frac{1}{2}$ of 7m. = $3\frac{1}{2}m.$, Ans.
13. A builds 5 times 7 rods; $\therefore$ B will build 5 times 9 rods = 45 rods in 33 days; again, 44 is $\frac{4}{5}$ of 33, $\therefore$ B, in 44 days, will build $\frac{4}{5}$ of 45 rods = 60 rods, Ans.
14. $\frac{1}{4}$ of 28 = 4, and $\frac{2}{3}$ of 28 = 12; if 12 is $\frac{1}{11}$, then 3 is $\frac{1}{11}$ and 33 is $1\frac{1}{11}$; $\frac{1}{5}$ of 55 is 11, and 11 in 33, 3 times; Ans. 3.
15. $\frac{1}{11}$ of 44 = 4, and $\frac{1}{11}$ of 44 = 20; if 20 is $\frac{4}{5}$ then 5 is $\frac{1}{5}$ and 45 is $\frac{9}{5}$; $\frac{1}{3}$ of 15 is 5, and 5 in 45, 9 times; Ans. 9.
16. $\frac{1}{3}$ of 27 = 9, and $\frac{2}{3}$ of 27 = 63; if 63 is $2\frac{1}{2}$, then 3 is $\frac{1}{2}$ and 15 is $\frac{5}{2}$; $\frac{1}{12}$ of 60 is 5, and 5 in 15, 3 times; Ans. 3.
17. The hound gains 3 rods in running 27; $\therefore$, as he must gain 13 times 3 rods, he must run 13 times 27 = 351 rods, Ans.
18. The hound gains 4 rods while the hare runs 8 rods; $\therefore$, as he must gain 8 times 4 rods, the hare will run 8 times 8 = 64 rods, Ans.

19. He now has 1 *flock*, and if he had one and one half times as many more he would have $2\frac{1}{2}$ *flocks*. Then, not having the $2\frac{1}{2}$ sheep, he would have only $97\frac{1}{2}$ *sheep*; $\therefore 97\frac{1}{2}$ sheep = $2\frac{1}{2}$ flocks, and $97\frac{1}{2} \div 2\frac{1}{2} = 39$, No. in 1 flock, Ans.
20. $12 \times 7 \times 2000 = 168000$, No. of rations;
 $168000 \times 14 = 2352000$, No. ounces, good and bad;
 $105 \times 200 \times 16 = 336000$, No. ounces spoiled;
 2016000 , No. oz. left to subsist on.
 $2016000 \div 168000 = 12$, No. ounces in 1 ration, Ans.
21. Reasoning as in Ex. 20, we find the whole weight to be $2352000\text{oz.} = 147000\text{lb.}$, 1st Ans. $147000\text{lb.} \div 7 = 21000\text{lb.}$, 2d Ans.
22. As above, whole weight = 147000lb. , 1st Ans. 12oz. = $\frac{1}{2}$ of 14 oz.; $\frac{1}{2}$ of $147000\text{lb.} = 126000\text{lb.}$, 2d Ans.
23. As above, whole weight = 147000lb. , 1st Ans. If 12oz. is $\frac{1}{2}$, then $\frac{1}{4}$ is 2oz. and $\frac{1}{4} = 14\text{oz.}$, 2d Ans.
24. $1 - \frac{1}{4} = \frac{3}{4}$; $\frac{1}{6}$ of $\frac{3}{4} = \frac{1}{8}$; $\frac{1}{4} + \frac{1}{8} = \frac{3}{8}$, portion spent;
 $1 - \frac{3}{8} = \frac{5}{8}$; if \$5000 = $\frac{5}{8}$, then \$1000 = $\frac{1}{8}$ and $\frac{3}{8} =$
\$8000, Ans.
25. $\frac{2 \times 28 \times 60 \times 60}{12 \times 5280} = 3\frac{2}{11}\text{m.}$, 1st Ans.
 $60 \div 3\frac{2}{11} + 1\frac{1}{2} = 20\frac{1}{2}\text{h.}$, 2d Ans.
26. $\frac{1}{10} + \frac{1}{12} + \frac{1}{15} = \frac{1}{4}$; if $\frac{1}{4}$ in one day, $\frac{1}{4}$ in 4 days, Ans.
27. $246\frac{18}{133} = 227\frac{36}{133}$; $\$ \frac{5}{12} - \$ \frac{3}{11} = \$ \frac{19}{132}$, gain per lb.;
 $\frac{248 \times 132 \times 133}{19 \times 32736} = 7$, No. bales, Ans.
-

28. Since the miller took $\frac{1}{8}$ for grinding, 60bbl. of flour were made out of $\frac{1}{8}$ of the wheat; $\therefore$ enough wheat was carried to mill to make 64bbl. of flour.

$$4\frac{1}{2}\text{bush.} \times 64 = 288\text{bush. carried to mill.}$$

$$3\frac{1}{4}\text{c.} \times 288 = \$10.50 \text{ for carting wheat.}$$

$$25\text{c.} \times 60 = 15.00 \text{ for barrels.}$$

$$\$1\frac{1}{4} \times 60 = 75.00 \text{ for carrying flour.}$$

$$25\text{c.} \times 60 = \underline{15.00} \text{ for agent.}$$

\$115.50, total expense.

$$\$367.50 - \$115.50 = \$252, \text{ net receipts.}$$

$$\$252 \div 288 = 87\frac{1}{2}\text{c., Ans.}$$

RATIO.

(ART. 320, p. 255.)

4. $\frac{8}{2} = 4\frac{1}{2}$.

5. $8 : 6$

$$\frac{9 : 2}{72 : 12 = 6, \text{ Ans.}}$$

6. $19 : 14$.

7. $5 : 4$.

PROPORTION.

(ART. 324, p. 256.)

3. $\frac{4 \times 9}{2} = 18, \text{ Ans.}$

4. $\frac{16 \times 7}{14} = 8, \text{ Ans.}$

(ART. 331, p. 259.)

3. 3bbl. : 7bbl. :: 15bush. : 35bush., Ans.

4. 40bush. : 75bush. :: 8bbl. : 15bbl., Ans.

5. 3d. : 8d. :: 75m. : 200m., Ans.

6. 64m. : 160m. :: 2d. : 5d., Ans.
8. $\overset{5}{4}\text{m.} : \overset{5}{20}\text{m.} :: 8\text{d.} : 40\text{d.}, \text{Ans.}$
9. $\overset{4}{24}\text{c.} : \overset{3}{18}\text{c.} :: \overset{15}{\$60} : \$45, \text{Ans.}$
10. $\overset{6}{5}\text{c.} : 12\text{c.} :: \overset{6}{\$30} : \$72, \text{Ans.}$
11. $\overset{5}{\$20} : \overset{9}{\$45} :: 4\text{c.} : 9\text{c.}, \text{Ans.}$
12. $\overset{7}{6}\text{h.} : 11\text{h.} :: \overset{7}{42}\text{bush.} : 77\text{bush.}, \text{Ans.}$
13. $\overset{6}{4}\text{t.} : 7\text{t.} :: \overset{6}{\$24} : \$42, \text{Ans.}$
14. 6m. : 10m. :: 72d. : 120d., Ans.
15. 30lb. : 20lb. :: 72lb. : 48lb., Ans.
16. \$18 : \$84 :: 3t. : 14t., Ans.
17. 30d. : 20d. :: 9h. : 6h., Ans.
18. 8h. : 6h. :: 20t. : 15t., Ans.
20. 32d. : 176d. :: 2c. : 11c., Ans.
21. 18076d. : 31633d. :: 8a. : 14a., Ans.
22. 14a. : 8a. :: 31633d. : 18076d. = 75£ 6s. 4d., Ans.
23. $\frac{5}{\$} : \frac{7}{\$} :: \$9875 : \$13825, \text{Ans.}$
24. $\frac{2}{\$}\text{bbl.} : 6\text{bbl.} :: \$3.20 : \$48, \text{Ans.}$
25. 12h. : 8h. :: 6d. : 4d., Ans.
26. \$300 : \$400 :: 6m. : 8m., Ans.
27. $\frac{1}{2}\text{yd.} : 1\frac{1}{2}\text{yd.} :: 20\text{yd.} : 40\text{yd.}, \text{Ans.}$
28. \$6 : \$9 :: 4oz. : 6oz., Ans.
29. 10h. : 12h. :: 45bush. : 54bush., Ans.
30. 4d. : 12d. :: 3m. : 9m.; 9m. — 3m. = 6m., Ans.
31. 36d. : 24d. :: 12m. : 8m.; 12m. — 8m. — = 4m., Ans.
32. 3lb. : 9lb. :: \$1.50 : \$4.50, Ans.

33. $.25 : .375 :: \$3000 : \$4500$, Ans.
34. $100\text{lb.} : 62\frac{1}{2}\text{lb.} :: \$24 : \$15$, Ans.
36. $4\text{ft.} : 240\text{ft.} :: 3\text{ft.} : 180\text{ft.}$, Ans.
37. $3\text{ft.} : 180\text{ft.} :: 4\text{ft.} : 240\text{ft.}$, Ans.
38. $240\text{ft.} : 4\text{ft.} :: 180\text{ft.} : 3\text{ft.}$, Ans.
39. $\$300 : \$850 :: \$18 : \$51$, Ans.
40. $\$24 : \$45 :: \$800 : \$1500$, Ans.
41. $3\text{yr.} : 11\text{yr.} :: \$2700 : \$9900$, Ans.
42. $\$9900 : \$2700 :: 11\text{yr.} : 3\text{yr.}$, Ans.
43. $1\frac{3}{4}\text{yd.} : \frac{3}{4}\text{yd.} :: 12\frac{1}{2}\text{yd.} : 6\frac{2}{3}\text{yd.}$, Ans.
44. $\frac{1}{8}\text{a.} : 15\frac{3}{8}\text{a.} :: \$36.40 : \$1242.15$, Ans.
45. $4\text{h.} : 6\text{h.} :: 2\text{d.} : 3\text{d.}$, Ans.
46. $3\text{c.} : 45\text{c.} :: 2\text{bbl.} : 30\text{bbl.}$, Ans.
47. $\$25000 : \$500 :: \$15000 : \$300$, Ans.
48. $\frac{2}{3}$ of $\frac{3}{5}$ or $\frac{2}{5} : 1 :: \$20000 : \$50000$, Ans.
49. $11 + 19 = 30 : 11 :: \$45.90 : \$16.83$, A's share.
 $30 : 19 :: \$45.90 : \$29.07$, B's share.
50. $5\text{d.} : 45\text{d.} :: 13\text{m.} : 117\text{m.}$; $117\text{m.} - 13\text{m.} = 104\text{m.}$,
 Ans.
51. $1\text{yr.} : 3\frac{1}{2}\text{yr.} :: \$42 : \$147$, Ans.
52. $(13\frac{1}{8} + 12) \times 2 = 50\frac{1}{4}$; $50\frac{1}{4}\text{ft.} \times 9 = 452\frac{1}{4}\text{ft.}$, area of
 the walls;
 $2\text{ft.} \times 3 = 6\text{ft.}$ area of a yard of paper;
 $6\text{ft.} : 452\frac{1}{4}\text{ft.} :: 1\text{yd.} : 75\frac{3}{4}\text{yd.}$, Ans.
53. $\$2 : \$168 :: 1\text{gal.} : 84\text{gal.}$; $84\text{gal.} - 63\text{gal.} = 21\text{gal.}$,
 Ans.
54. $60\text{d.} : 98\text{d.} :: 30\text{m.} : 49\text{m.}$, Ans.
55. $1800\text{m.} : 1500\text{m.} :: 12\text{m.} : 10\text{m.}$, Ans.
56. $2\text{rd.} : 8\text{rd.} :: 20\text{rd.} : 80\text{rd.}$, Ans.
57. $366\text{rev.} : 1\text{rev.} :: 365\text{d.} : 3\frac{8}{11}\text{d.} = 23\text{h. } 56\frac{4}{11}\text{m.}$, Ans.

58. 8ft. : 16ft. :: 6m. : 12m., Ans.
 59. 4d. : 12d. :: 12m. : 36m., Ans.
 60. 8h. : 12h. :: 6d. : 9d., Ans.
 61. 45m. : 360m. :: 1 pipe : 8 pipes, Ans.
 62. $\frac{1}{3} + \frac{1}{4} + \frac{1}{5} = \frac{47}{60}$; $\frac{47}{60} : \frac{88}{60} :: 1\text{h.} : 1\frac{1}{4}\text{h.}$, Ans.
 63. 7lb. : 19lb. :: \$3.50 : \$9.50, Ans.
 64. $\frac{1}{6} - \frac{1}{8} = \frac{1}{24}$; $\frac{1}{24} : \frac{3}{4} :: 1\text{d.} : 24\text{d.}$, Ans.
 65. 16t. : 72t. :: 2h. : 9h., Ans.
 66. \$25.50 : \$1925.25 :: 1a. : 75.5a. = 75a. 2r., Ans.
 67. 12oz. : 14oz. :: 120d. : 140d., Ans.
 68. $\frac{5}{11} : \frac{1}{6} :: \$25000 : \frac{\$25000 \times 11 \times 11}{16 \times 5} =$
 \$37812.50, Ans.
 69. 100lb. : 37 $\frac{1}{2}$ lb. :: \$27 : \$10.125, Ans.
 70. 1sec. : 207sec. :: 19m. : 3933m., Ans.

COMPOUND PROPORTION.

(Art. 334, p. 265.)

4. 6 persons : 10 persons } :: \$600 : \$1750, Ans.
 8m. : 14m. }
 5. 10 persons : 6 persons } :: 8m. : 14m., Ans.
 \$600 : \$1750 }
 6. 14m. : 8m. } :: 6 persons : 10 persons, Ans.
 \$600 : \$1750 }
 7. 12 boxes : 40 boxes }
 4cwt. : 3 $\frac{1}{2}$ cwt. } :: \$8 : \$43.75, Ans.
 40m. : 75m. }
 8. 84ft. : 336ft. } :: 4m. : 10m., Ans.
 4d. : 2 $\frac{1}{2}$ d. }

9. $\left. \begin{array}{l} 84\text{ft. long} : 420\text{ft. long} \\ 5\text{ft. wide} : 3\text{ft. wide} \\ 4\text{d.} : 3\text{d.} \end{array} \right\} :: 4\text{m.} : 9\text{m., Ans.}$
10. $\left. \begin{array}{l} 50\text{ft. long} : 300\text{ft. long} \\ 5\text{ft. wide} : 2\frac{1}{2}\text{ft. wide} \\ 3\text{ft. deep} : 4\text{ft. deep} \\ 7\text{d.} : 3\frac{1}{2}\text{d.} \end{array} \right\} :: 2\text{m.} : 4\text{m., Ans.}$

ARRANGEMENT FOR CANCELLING.

$$\frac{300 \times 5 \times 4 \times 7 \times 2\text{m.}}{50 \times 2 \times 5 \times 3 \times 2 \times 7} = 4\text{m., Ans.}$$

11. $\left. \begin{array}{l} 4\text{deg.} : 6\text{deg.} \\ 35\text{ft. long} : 105\text{ft. long} \\ 6\text{ft. wide} : 4\text{ft. wide} \\ 5\text{ft. deep} : 3\text{ft. deep} \\ 2\text{d.} : 5\text{d.} \end{array} \right\} :: 6\text{m.} : 27\text{m., Ans.}$
12. $\left. \begin{array}{l} 9\text{d.} : 4\text{d.} \\ 8\frac{1}{2}\text{h.} : 10\text{h.} \\ 10\text{deg.} : 5\text{deg.} \\ 50\text{ft. long} : 75\text{ft. long} \\ 3\text{ft. wide} : 4\frac{1}{2}\text{ft. wide} \\ 6\frac{1}{4}\text{ft. deep} : 4\frac{1}{4}\text{ft. deep} \end{array} \right\} :: 5\text{m.} : 2\text{m., Ans.}$

ARRANGEMENT FOR CANCELLING.

$$\frac{4 \times 10 \times 5 \times 75 \times 4\frac{1}{2} \times 4\frac{1}{4} \times 5\text{m.}}{9 \times 8\frac{1}{2} \times 10 \times 50 \times 3 \times 6\frac{1}{4}} \text{ or, reducing}$$

$$\frac{4 \times 10 \times 2 \times 5 \times 75 \times 9 \times 17 \times 4 \times 5\text{m.}}{9 \times 17 \times 10 \times 50 \times 2 \times 3 \times 4 \times 25} = 2\text{m., Ans.}$$

EXPLANATION. — It requires less men to dig a trench in 9 days than in 4 days; more to do it when the days are $8\frac{1}{2}$ hours long than when they are 10 hours; less when it is of 5 degrees of hardness than when it is of 10; more when it is 75ft. long than when it is 50ft. long; more when it is $4\frac{1}{2}$ ft. wide than when it is 3ft. wide; less when it is $4\frac{1}{4}$ ft. deep than when it is $6\frac{1}{4}$ ft. deep.

13. $\$100 : \$300 \left. \vphantom{\$100} \right\} :: \$6 : \$12, \text{ Ans.}$
 $12\text{m.} : 8\text{m.} \left. \vphantom{12\text{m.}} \right\}$
14. $\$300 : \$100 \left. \vphantom{\$300} \right\} :: \$12 : \$6, \text{ Ans.}$
 $8\text{m.} : 12\text{m.} \left. \vphantom{8\text{m.}} \right\}$
15. $\$300 : \$100 \left. \vphantom{\$300} \right\} :: 12\text{m.} : 8\text{m.}, \text{ Ans.}$
 $\$6 : \$12 \left. \vphantom{\$6} \right\}$
16. $\$6 : \$12 \left. \vphantom{\$6} \right\} :: \$100 : \$300, \text{ Ans.}$
 $8\text{m.} : 12\text{m.} \left. \vphantom{8\text{m.}} \right\}$
17. $2\text{d.} : 38\text{d.} \left. \vphantom{2\text{d.}} \right\} :: 9\text{oz.} : 234\text{oz.} = 14\text{lb. } 10\text{oz.}, \text{ Ans.}$
 $57\text{d.} : 78\text{d.} \left. \vphantom{57\text{d.}} \right\}$
18. $8\text{ft.} : 24\text{ft.} \left. \vphantom{8\text{ft.}} \right\} :: 6\text{m.} : 24\text{m.}, \text{ Ans.}$
 $9\text{d.} : 12\text{d.} \left. \vphantom{9\text{d.}} \right\}$
19. $8 \text{ persons} : 12 \text{ persons} \left. \vphantom{8 \text{ persons}} \right\} :: 6\text{bbl.} : 12\text{bbl.}, \text{ Ans.}$
 $12\text{m.} : 16\text{m.} \left. \vphantom{12\text{m.}} \right\}$
20. $16\text{h.} : 23\text{h.} \left. \vphantom{16\text{h.}} \right\} :: 24\text{bush.} : 115\text{bush.}, \text{ Ans.}$
 $6\text{d.} : 20\text{d.} \left. \vphantom{6\text{d.}} \right\}$
21. $2000\text{m.} : 1600\text{m.} \left. \vphantom{2000\text{m.}} \right\} :: 24\text{oz.} : 16\text{oz.}, \text{ Ans.}$
 $30\text{d.} : 25\text{d.} \left. \vphantom{30\text{d.}} \right\}$
22. $6\text{d.} : 2\text{d.} \left. \vphantom{6\text{d.}} \right\} :: 3\text{comp.} : 2\text{comp.}, \text{ Ans.}$
 $8\text{h.} : 9\text{h.} \left. \vphantom{8\text{h.}} \right\}$
 $27\text{p.} : 36\text{p.} \left. \vphantom{27\text{p.}} \right\}$
 $36 \text{ lines} : 40 \text{ lines} \left. \vphantom{36 \text{ lines}} \right\}$
 $45 \text{ letters} : 54 \text{ letters} \left. \vphantom{45 \text{ letters}} \right\}$
23. $10\text{h.} : 12\text{h.} \left. \vphantom{10\text{h.}} \right\} :: 8\text{d.} : 6\text{d.}, \text{ Ans.}$
 $384\text{m.} : 240\text{m.} \left. \vphantom{384\text{m.}} \right\}$
24. $7\text{d.} : 12\text{d.} \left. \vphantom{7\text{d.}} \right\} :: 280\text{m.} : 432\text{m.}, \text{ Ans.}$
 $10\text{h.} : 9\text{h.} \left. \vphantom{10\text{h.}} \right\}$
25. $8\text{wk.} : 6\text{wk.} \left. \vphantom{8\text{wk.}} \right\} :: 2\text{t.} : 6\text{t.}, \text{ Ans.}$
 $10 \text{ oxen} : 40 \text{ oxen} \left. \vphantom{10 \text{ oxen}} \right\}$

EXPLANATION. — If 12 horses = 10 oxen, then 1 horse = $\frac{10}{12} = \frac{5}{6}$ of an ox, and $\therefore$ 18 horses = 15 oxen; hence 18 horses and 25 oxen = 40 oxen.

26. 1500 copies : 2500 copies }
 11 sheets : 9 sheets } :: 33 reams : 45 reams,
 Ans.
27. 10in. long : 12in. long }
 8in. wide : 12in. wide } :: 600 : 1620, No. tiles, Ans.
 1 : 3
 1 : $\frac{1}{2}$
28. 8in. long : 24in. long }
 4in. wide : 18in. wide } :: 600 : 32400, No. bricks,
 2in. thick : 8in. thick } Ans.
29. 7 shares : 12 shares }
 3m. : 24m. } :: \$17.50 : \$240, Ans.
30. 24d. : 16d. }
 9h. : 12h. }
 30ft. long : 45ft. long } :: 3m. : 9m., Ans.
 8ft. high : 9ft. high }
 3ft. thick : 6ft. thick }
31. 9hhd. : 50tierces }
 12cwt. : 2 $\frac{1}{2}$ cwt. } :: \$50 : \$289.35 $\frac{5}{7}$, Ans.
 60m. : 300m. }
32. \$300 : \$100 }
 \$6 : \$18 } :: 6 per cent. : 8 per cent., Ans.
 9m. : 12m. }

EXPLANATION. — 6 per cent. is assumed, it being a customary rate. Any other rate may be assumed just as well. \$300 require a smaller rate than \$100 to gain a given interest. It requires a larger rate to gain \$18 than to gain \$6, the interest of \$100 for 1 year at the assumed rate. It requires a larger rate to gain a given sum in 9 months than in 12 months.

33. 25in. long : 21 $\frac{1}{2}$ in. long }
 6in. wide : 8in. wide }
 3in. thick : 4in. thick } :: \$2725 : \$128293, Ans.
 10.47 : 19.26
 2 : 33

$$\begin{array}{lcl}
 34. & 22d. & : 5d. \\
 & 540m. & : 726m. \\
 & 9deg. & : 2deg. \\
 & 465ft. long & : 168\frac{1}{2}ft. long \\
 & 3\frac{1}{2}ft. wide & : 7\frac{1}{2}ft. wide \\
 & 4\frac{1}{2}ft. deep & : 2\frac{1}{2}ft. deep
 \end{array}
 \left. \vphantom{\begin{array}{lcl} 34. & 22d. & : 5d. \\ & 540m. & : 726m. \\ & 9deg. & : 2deg. \\ & 465ft. long & : 168\frac{1}{2}ft. long \\ & 3\frac{1}{2}ft. wide & : 7\frac{1}{2}ft. wide \\ & 4\frac{1}{2}ft. deep & : 2\frac{1}{2}ft. deep \end{array}} \right\} :: 496 : 15 \text{ men, Ans.}$$

ARRANGEMENT FOR CANCELLING.

$$\begin{array}{r}
 5 \times 726 \times 2 \times 675 \times 15 \times 3 \times 14 \times 3 \times 496 \text{ men} \\
 \hline
 22 \times 540 \times 9 \times 4 \times 465 \times 2 \times 11 \times 5 \times 14 \\
 = 15 \text{ men, Ans.}
 \end{array}$$

ALLIGATION.

(ART. 337, p. 268.)

$$\begin{array}{rcl}
 2. & 80c. \times 20 = \$16 \\
 & \$1 \times 10 = 10 \\
 & 35c. \times 40 = 14 \\
 & 90c. \times 30 = 27 \\
 & \hline
 & 100) \quad \$67 \\
 & \text{Ans. } 67c.
 \end{array}$$

$$\begin{array}{rcl}
 3. & 6c. \times 10 = 60c. \\
 & 8c. \times 12 = 96c. \\
 & 12c. \times 4 = 48c. \\
 & 15c. \times 5 = 75c. \\
 & \hline
 & 31) \quad 279c. \\
 & \text{Ans. } 9c.
 \end{array}$$

(ART. 339, p. 270.)

REMARK. — It is sometimes said that the mode of solving examples in Alligation by the “*linking*” process is “*arbitrary*” and “*blind*.” It is believed, however, that it is perfectly philosophical and very simple.

By this process, however many ingredients enter into the mixture, *they always balance in pairs*; the gain derived from putting into the mixture a quantity of a low-priced article being offset by the loss sustained by putting in a quantity of an expensive article. The lines or “links” used in *connecting* the prices of the simples are merely for convenience of reference.

For illustration take Ex. 2, p. 270 of the Arithmetic, and we have the following solutions:—

BY ANALYSIS.

$$10c. \left\{ \begin{array}{c|c|c|c} c. & lb. & lb. & lb. \\ 6 & \frac{1}{4} & & 6 \\ 8 & & \frac{1}{2} & 3 \\ 13 & & \frac{1}{3} & 2 \\ 16 & \frac{1}{6} & & 4 \end{array} \right\} \text{Ans.}$$

BY LINKING.

$$10c. \left\{ \begin{array}{c|c} c. & lb. \\ 6 & 6 \\ 8 & 3 \\ 13 & 2 \\ 16 & 4 \end{array} \right\} \text{Ans.}$$

EXPLANATION.—By selling one pound of the 6-cent sugar for 10 cents we gain 4c., and $\therefore$ to gain 1c. will require only $\frac{1}{4}$ of a pound, which is placed at the right of the 6c. Again, by selling a pound of the 16-cent sugar for 10c. we lose 6c., and $\therefore$ to lose 1c. will require only $\frac{1}{6}$ of a pound, which is placed at the right of the 16c. Hence, $\frac{1}{4}$ of a pound of the 6-cent sugar and $\frac{1}{6}$ of a pound of the 16-cent sugar, or *any equimultiples* of these fractions, will make a mixture worth 10c. per pound. In like manner it is evident that $\frac{1}{2}$ lb. of the 8-cent sugar and $\frac{1}{3}$ lb. of the 13-cent sugar, or any equimultiples of these fractions, will make a mixture of the required price per pound. Now if $\frac{1}{4}$ and $\frac{1}{6}$ are multiplied by 24, the product of their denominators, we obtain 6 and 4, which are respectively placed in the Ans., at the right of the 6c. and 16c. in the above analysis; and if the $\frac{1}{2}$ and $\frac{1}{3}$ are multiplied by 6, the product of *their* denominators, we obtain 3 and 2, which are placed at the right of the 8c. and 13c. Thus a mixture worth 10 c. per pound is formed, by taking 6, 3, 2, and 4 pounds of sugar at 6c., 8c., 13c., and 16c. per pound, severally.

It will be seen that the 6 placed in the Ans. against 6c. is the difference between 10, the mean rate, and 16; and the 4 placed against the 16 is the difference between 10 and 6. So in each couplet compared, the number obtained in the answer for *either term is the difference between the mean rate and the other term*; but by the “linking” process, Rule in Art. 340, we have precisely and necessarily the same result, and with much less labor.

NOTE.—The following examples in Alligation are solved only by the method explained in Art. 341, that being considered the most convenient mode, and the best for practical purposes.

$$\begin{array}{lcl}
 4. \text{ Assume} & \begin{array}{l} \text{lb.} \quad \text{c.} \quad \text{c.} \\ \left\{ \begin{array}{l} 30 \text{ at } 25, \text{ gain } 600 \\ 14 \text{ at } 33, \text{ gain } 168 \\ 6 \text{ at } 48, \text{ loss } 18 \\ 12 \text{ at } 56, \text{ loss } 132 \\ 20 \text{ at } 75, \text{ loss } 600 \\ \hline 6 \text{ at } 48, \text{ loss } 18 \end{array} \right. \end{array} & \begin{array}{l} \\ \\ \\ \\ \\ \\ \end{array} \\
 45\text{c.} & & \\
 & & \left. \begin{array}{l} \\ \\ \\ \\ \\ \end{array} \right\} = \$7.68, \text{ gain.} \\
 & & \\
 & & \left. \begin{array}{l} \\ \\ \\ \\ \\ \end{array} \right\} = \$7.68, \text{ loss.}
 \end{array}$$

Ans. 30lb. at 25c., 14lb. at 33c., 12lb. at 48c., 12lb. at 56c., 20lb. at 75c.

$$\begin{array}{lcl}
 5. \text{ Assume} & \begin{array}{l} \text{cows.} \quad \$ \quad \$ \\ \left\{ \begin{array}{l} 20 \text{ at } 16, \text{ gain } 280 \\ 10 \text{ at } 20, \text{ gain } 100 \\ 12 \text{ at } 28, \text{ gain } 24 \\ 12 \text{ at } 40, \text{ loss } 120 \\ 14 \text{ at } 50, \text{ loss } 280 \\ \hline 2 \text{ at } 28, \text{ loss } 4 \end{array} \right. \end{array} & \begin{array}{l} \\ \\ \\ \\ \\ \\ \end{array} \\
 \$30 & & \\
 & & \left. \begin{array}{l} \\ \\ \\ \\ \\ \end{array} \right\} = \$404, \text{ gain.} \\
 & & \\
 & & \left. \begin{array}{l} \\ \\ \\ \\ \\ \end{array} \right\} = \$404, \text{ loss.} \\
 \text{Abate} & &
 \end{array}$$

Ans. 20, 10, 10, 12, and 14 cows at \$16, \$20, \$28, \$40, and \$50.

(ART. 342, p. 272.)

1. 15lb. at 4c.
9lb. at 6c.
6lb. at 9c.
6lb. at 10c.
12lb. at 13c.

$$\begin{array}{lcl}
 2. \text{ Assume} & \begin{array}{l} \text{gal.} \quad \text{s.} \quad \text{s.} \\ \left\{ \begin{array}{l} 15 \text{ at } 0, \text{ gain } 180 \\ 15 \text{ at } 8, \text{ gain } 60 \\ 15 \text{ at } 10, \text{ gain } 30 \\ 40 \text{ at } 15, \text{ loss } 120 \\ \hline 50 \text{ at } 15, \text{ loss } 150 \end{array} \right. \end{array} & \begin{array}{l} \\ \\ \\ \\ \\ \end{array} \\
 12\text{s.} & & \\
 & & \left. \begin{array}{l} \\ \\ \\ \\ \end{array} \right\} = 270\text{s.}, \text{ gain.} \\
 & & \\
 & & \left. \begin{array}{l} \\ \\ \\ \end{array} \right\} = 270\text{s.}, \text{ loss.} \\
 \text{Add} & &
 \end{array}$$

Ans. 15, 15, and 90 gal. at 8, 10, and 15s.

NOTE. — In solving examples in Art. 342, assume the *given quantity* of that kind whose quantity *is* given, and vary the others as convenience dictates.

$$\begin{array}{rcl}
 3. \text{ Assume} & \left\{ \begin{array}{l} \text{lb.} \quad \text{c.} \quad \text{c.} \\ 24 \text{ at } 45, \text{ loss } 72 \\ 144 \text{ at } 50, \text{ loss } 1152 \end{array} \right\} & = \$12.24, \text{ loss.} \\
 42\text{c.} & \left\{ \begin{array}{l} 30 \text{ at } 40, \text{ gain } 60 \\ 96 \text{ at } 30, \text{ gain } 1152 \end{array} \right\} & = \$12.24, \text{ gain.} \\
 \text{Add} & \underline{6 \text{ at } 40, \text{ gain } 12} & \\
 \text{Ans. } 144, 36, \text{ and } 96\text{lb. at } 50, 40 \text{ and } 30\text{c.} & &
 \end{array}$$

(ART. 343, p. 273.)

1. 28lb. at 8c.
4lb. at 11c.
8lb. at 14c.
20lb. at 20c.

$$\begin{array}{rcl}
 2. \text{ Assume} & \left\{ \begin{array}{l} \text{oz.} \quad \text{carats.} \quad \text{carats.} \\ 3 \text{ at } 16, \text{ gain } 15 \\ 3 \text{ at } 18, \text{ gain } 9 \\ 3 \text{ at } 20, \text{ gain } 3 \end{array} \right\} & \begin{array}{l} \text{carats.} \\ = 27, \text{ gain.} \end{array} \\
 21 \text{ carats.} & \left\{ \begin{array}{l} 6 \text{ at } 24, \text{ loss } 18 \\ 3 \text{ at } 24, \text{ loss } 9 \end{array} \right\} & = 27, \text{ loss.} \\
 \text{Add} & \underline{18, \text{ sum of proportional parts.}} &
 \end{array}$$

$$\begin{array}{l}
 \text{oz.} \quad \text{oz.} \quad \text{oz.} \quad \text{oz.} \\
 18 : 72 :: 3 : 12 \text{ at } 16, 18, \text{ and } 20 \text{ carats,} \\
 18 : 72 :: 9 : 36 \text{ at } 24 \text{ carats,}
 \end{array} \left. \vphantom{\begin{array}{l} 18 : 72 :: 3 : 12 \\ 18 : 72 :: 9 : 36 \end{array}} \right\} \text{Ans.}$$

$$\begin{array}{rcl}
 3. \text{ Assume} & \left\{ \begin{array}{l} \text{sheep.} \quad \text{s.} \quad \text{s.} \\ 9 \text{ at } 9, \text{ gain } 54 \\ 6 \text{ at } 12, \text{ gain } 18 \end{array} \right\} & = 72\text{s., gain.} \\
 15\text{s.} & \left\{ \begin{array}{l} 3 \text{ at } 16, \text{ loss } 3 \\ 3 \text{ at } 18, \text{ loss } 9 \\ 6 \text{ at } 24, \text{ loss } 54 \end{array} \right\} & = 72\text{s., loss.} \\
 \text{Abate} & \underline{2 \text{ at } 12, \text{ loss } 6} &
 \end{array}$$

25, sum of proportional parts.

sheep. sheep. sheep. sheep.

$$\begin{array}{l}
 25 : 125 :: 9 : 45 \text{ at } 9\text{s.} \\
 25 : 125 :: 4 : 20 \text{ at } 12\text{s.} \\
 25 : 125 :: 3 : 15 \text{ at } 16\text{s. and } 18\text{s.} \\
 25 : 125 :: 6 : 30 \text{ at } 24\text{s.}
 \end{array} \left. \vphantom{\begin{array}{l} 25 : 125 :: 9 : 45 \\ 25 : 125 :: 4 : 20 \\ 25 : 125 :: 3 : 15 \\ 25 : 125 :: 6 : 30 \end{array}} \right\} \text{Ans.}$$

INVOLUTION.

(ART. 346, p. 274.)

2. $3^5 = 3 \times 3 \times 3 \times 3 \times 3 = 243$, Ans.
3. $5^4 = 5 \times 5 \times 5 \times 5 = 625$, Ans.
4. $2^8 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 256$, Ans.
5. $16^2 = 16 \times 16 = 256$, Ans.
7. $\frac{8}{15} = \frac{2}{5}$; $(\frac{2}{5})^2 = \frac{2}{5} \times \frac{2}{5} = \frac{4}{25}$, Ans.
8. $.03^3 = .03 \times .03 \times .03 = .000027$, Ans.
9. $.12^4 = .12 \times .12 \times .12 \times .12 = .00020736$, Ans.
11. $3\frac{1}{5} = \frac{16}{5}$; and $(\frac{16}{5})^3 = \frac{4096}{125} = 32\frac{96}{125}$, Ans.
13. $5^2 \times 5^4 = 5^2 + 4 = 5^6$, Ans.
14. $(3^3)^4 = 3^3 \times 4 = 3^{12}$, Ans.
15. $(2^4)^5 = 2^4 \times 5 = 2^{20}$, Ans.
17. $8^9 \div 8^7 = 8^9 - 7 = 8^2 = 64$, Ans.
18. $4^7 \div 4^3 = 4^7 - 3 = 4^4 = 256$, Ans.

EVOLUTION.

SQUARE ROOT.

4.	823	17.	16807
7.	369	19.	.25
8.	6482	21.	77.76
9.	6561	25.	17.776+
10.	4692	26.	5.621+
11.	1234	29.	$2\frac{2}{5}$
12.	4321	31.	$3\frac{1}{5}$
13.	2468	32.	$\frac{8}{5}$
15.	2401	34.	.605+
16.	1024		

APPLICATION OF THE SQUARE ROOT.

3. The line on the ground, 21ft., is the base, and the height of the window, 28ft., is the perpendicular, and the ladder the hypotenuse of a right-angled triangle; hence $\sqrt{21^2 + 28^2} = \sqrt{1225} = 35\text{ft.}$, Ans.
4. The stub, 24ft., is the perpendicular, 64ft. — 24ft. = 40ft., the hypotenuse, and the line on the ground, the base of a right-angled triangle; $\therefore \sqrt{40^2 - 24^2} = \sqrt{1024} = 32\text{ft.}$, Ans.
5. $\sqrt{40^2 + 9^2} = \sqrt{1681} = 41\text{m.}$, Ans.
6. $\sqrt{9801} = 99$, Ans.
7. In 640 acres there are $160 \times 640 = 102400$ square rods; $\sqrt{102400} = 320$; $320 \times 4 = 1280$, Ans.
8. Let ABCD represent the orchard; now if $\frac{1}{3}$ of it is cut off by the line EF, there will remain a square, AEFD, containing 400 trees; $\therefore \sqrt{400} = 20$, No. of rows; and $2 : 3 :: 20 : 30$, No. of trees in a row. Hence there are 19 *spaces* between the *rows*, and 29 spaces between the *trees in a row*.
- | | | |
|--|---|---|
| D | F | C |
| <div style="position: absolute; top: 0; right: 0; width: 100%; height: 100%; border-left: 1px solid black;"></div> | | |
| A | E | B |
- $19 \times 25 + 25 = 500\text{ft.}$ width of the field;
 $29 \times 25 + 25 = 750\text{ft.}$ length of the field;
 $750 \times 500 = 375000\text{sq. ft.}$, Ans.
9. The areas of the two ponds are to each other in the ratio $1 : 25$; $\therefore 1 : 25 :: 8^2 : \text{square of required diameter}$; and evolving, $1 : 5 :: 8 : \text{required diameter} = 40\text{rd.}$, Ans.
10. $24 : 96 :: 8^2 : \text{square of required side}$, and cancelling 24 in first ratio and evolving, $1 : 2 :: 8 : \text{required side} = 16\text{in.}$, Ans.

11. $1 : 36 :: 5^2 : \text{square of required side, and evolving,}$
 $1 : 6 :: 5 : \text{required side} = 30\text{ft.}, \text{ Ans.}$
12. $100^2 = 10000; .785398 \times 10000 = 7853.98;$
 $\sqrt{7853.98} = 88.622\text{sq. ft.}, \text{ Ans.}$
13. $10\text{a.} = 1600\text{sq. rd.}; 1600 \div .785398 = 2037.183695 +;$
 $\sqrt{2037.183695} = 45.135 + \text{rd.}, \text{ Ans.}$
14. According to Ex. 13 the diameter of 10-acre lot is
 $45.135\text{rd.};$
 $45.135 \times 3.141592 = 141.7957\text{rd.}, \text{ circumference};$
 $\sqrt{1600} = 40\text{rd.}, 1 \text{ side of a square } 10\text{-acre lot};$
 $40 \times 4 = 160\text{rd.}, 4 \text{ sides of a square } 10\text{-acre lot};$
 $160 - 141.7957 = 18.204\text{rd.}, \text{ difference of fence};$
 $75\text{c.} \times 18.204 = \$13.653, \text{ Ans.}$
15. $18 : 8 :: 3^2 : \text{square of required diameter dividing}$
 by 2 and evolving, $3 : 2 :: 3 : \text{required diameter} =$
 $2 \text{ in.}, \text{ Ans.}$
16. If $\frac{1}{2}$ of the rectangle is cut off, the part cut off will be
 a square, and will contain $10\text{a.} = 1600\text{sq. rd.};$
 $\sqrt{600} = 40\text{rd.}, \text{ width}; 40 \times 5 = 200\text{rd.}, \text{ length,}$
 Ans.
17. $\sqrt{16^2 + 12^2} = 400 = \text{the square of the diagonal of}$
 the *floor*: then the square of this diagonal + the
 square of the height of the room, $9\text{ft.}, = \text{the square}$
 of the required line; i. e. *the sum of the squares of the*
three dimensions of any rectangular body is the square
of the diagonal of that body; $\therefore$
 $\sqrt{16^2 + 12^2 + 9^2} = \sqrt{481} = 21.931\text{ft.}, \text{ Ans.}$
19. $18^2 = 324; 324 \div 2 = 162; \sqrt{162} = 12.727 + \text{in.}, \text{ Ans.}$

CUBE ROOT.

5.	147	12.	21.6
6.	726	13.	3.43
7.	2002	15.	$\frac{3}{4}^3 = 8\frac{1}{4}$
8.	729	17.	3.522+
9.	512		

APPLICATION OF THE CUBE ROOT.

3. $1 \div \frac{1}{4} = 4$; $4^3 = 64$, Ans.
 or, $(\frac{1}{4})^3 : 1^3 :: 1 : 64$, Ans.
4. $6400 \div 100 = 64$; $\sqrt[3]{64} = 4$ in., Ans.
 or, $100 : 6400 :: 1^3 : 64$; $\sqrt[3]{64} = 4$ in., Ans.
5. $\sqrt[3]{1} : \sqrt[3]{1404928} :: 7912 : 886144$ m., Ans.
6. $8 \times 4 \times 2 = 64$ ft., solid contents of bin;
 $\sqrt[3]{64} = 4$ ft., Ans.
7. $\sqrt[3]{27} : \sqrt[3]{8} :: 24 : 16$ ft. Ans.
8. $\sqrt[3]{1} : \sqrt[3]{27} :: 4 : 12$ in. }
 $\sqrt[3]{1} : \sqrt[3]{27} :: 3 : 9$ in. } Ans.
 $\sqrt[3]{1} : \sqrt[3]{27} :: \frac{1}{4} : \frac{3}{4}$ in. }
9. $\sqrt[3]{8} : \sqrt[3]{1} :: 10 : 5$ in., Ans.

ARITHMETICAL PROGRESSION.

(ART. 369, p. 293.)

3. $\$100 + 25 \times \$6 = \$250$, Ans.

NOTE. — In Example 3, and all similar examples, the *principal* is the *first* term, the amount for the *first* year is the *second* term, the amount for the *second* year is the *third* term, etc.; $\therefore$ the number of terms is one more than the number of years.

(ART. 370, p. 294.)

2. $22 - 2 = 20$; $20 \div 5 = 4\text{yr.}$, Ans.
 3. $\$160 - \$100 = \$60$; $60 \div 10 = 6$ per cent., Ans.

(ART. 371, p. 294.)

2. $19 - 1 = 18$; $18 \div 2 = 9$; $9 + 1 = 10$, Ans.

(ART. 372, p. 295.)

2. $(1 \times 12) \times \frac{1}{2} = 78$, Ans.

GEOMETRICAL PROGRESSION.

(ART. 375, p. 296.)

3. $1.06^3 = 1.191016$; $5 \times 1.191016 = 5.95508$, Ans.
 4. $1.05^4 = 1.21550625$; $\$10 \times 1.21550625 = \$12.1550625$,
 Ans.
 5. $72 \div 12 = 6$; $2^6 = 64$; $\$100 \times 64 = \$6400$, Ans.

(ART. 376, p. 297.)

2. $48 \div 3 = 16$; $\sqrt{16} = 4$,
 or, $3 \div 48 = \frac{1}{16}$; $\sqrt{\frac{1}{16}} = \frac{1}{4}$, } Ans.
 3. $243 \div 3 = 81$; $\sqrt[4]{81} = 3$,
 or, $3 \div 243 = \frac{1}{81}$; $\sqrt[4]{\frac{1}{81}} = \frac{1}{3}$ } Ans.

(ART. 377, p. 297.)

2. $5184 - 4 = 5180$; $5180 \div 5 = 1036$; $1036 + 5184$
 $= 6220$, Ans.
 3. $2^{11} = 2048$, last term. (Prob. 1.)
 $2048 - 1 = 2047$; $2047 + 2048 = 4095$, Ans.

ANNUITIES.

(ART. 379, p. 298.)

2. $\$5000 \div 5 = \$1000$, annual instalment;
 $\$1000 + 4 \times \$60 = \$1240$, last term;
 $(\$1000 + \$1240) \times \frac{1}{2} = \$5600$, Ans.
3. $\$600 + 7 \times \$42 = \$894$, last term; -
 $(\$600 + 7 \times \$42 = \$894$, last term;
 $(\$600 + \$894) \times 4 = \$5976$, Ans.

(ART. 380, p. 299.)

2. $\$5.637093$, amount of $\$1$ for 5yr. at 6 per cent. in table;
 $\$5.637093 \times 10000 = \$5637.093$, Ans.
3. 21.578564£ , amount of 1£ for 15yr. at 5 per cent.;
 $21.578564\text{£} \times 100 = 2157.8564\text{£} = 2157\text{£ } 17\text{s. } 1\text{d. } 2\text{qr.}$, Ans.
4. $\$16.869941$, amount of $\$1$ for 12yr. at 6 per cent.;
 $\$16.869941 \times 500 = \$8434.9705$, Ans.

PERMUTATIONS.

(ART. 382, p. 300.)

2. $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10 = 3628800$, Ans.

MENSURATION.

(ART. 386, p. 301.)

1. $7 \times \frac{8}{2} = 28\text{sq.in.}$, Ans.
2. $\frac{8}{2} \times 11 = 44\text{sq.ft.}$, Ans.

(ART. 388, p. 302.)

1. $20 \times \frac{3}{2} = 60\text{sq.in.}$; $20 \times \frac{3}{2} = 80\text{sq.in.}$; $60\text{sq.in.} + 80\text{sq.in.} = 140\text{sq.in.}$, Ans.

(ART. 389, p. 303.)

1. $\frac{10 + 12}{2} \times 6 = 66\text{sq.ft.}, \text{Ans.}$
2. $18\text{in.} = 1\frac{1}{2}\text{ft.}; (2 + 1\frac{1}{2}) \times 5 = 17\frac{1}{2}\text{sq.ft.}, \text{Ans.}$

(ART. 390, p. 303.)

1. $40 \times 8 = 320\text{sq.rd.} = 2\text{a.}, \text{Ans.}$
2. $6 \times 4 = 24\text{sq.ft.}, \text{Ans.}$

(ART. 392, p. 303.)

1. $37.699104 \times \frac{5}{2} = 113.097312, \text{Ans.}$
2. $3.141592 \times 10^2 = 314.1592, \text{Ans.}$

(ART. 394, p. 304.)

1. $10 \times 16 = 160$
 $4 \times 4 \times 2 = \frac{32}{192\text{sq.in.}}, \text{Ans.}$
2. $3.141592 \times 4 = 12.566368, \text{circumference of base};$
 $12.566368 \times 20 = 251.32736$
 $.785398 \times 4^2 \times 2 = \frac{25.132736}{276.460096\text{sq.ft.}}, \text{Ans.}$

(ART. 395, p. 304.)

1. $.785398 \times 10^2 = 78.5398, \text{area of base};$
 $78.5398 \times 20 = 1570.796\text{c.in.}, \text{Ans.}$
2. $3 \times 3 = 9\text{sq.ft.}, \text{area of base};$
 $9 \times 25 = 225\text{sq.ft.}, \text{Ans.}$

(ART. 397, p. 305.)

1. $.785398 \times 10^2 = 78.5398, \text{area of base};$
 $78.5398 \times 2\frac{2}{3} = 628.3184\text{cu.ft.}, \text{Ans.}$
2. $6 \times \frac{8}{2} = 24\text{sq.in.}, \text{area of base};$
 $24 \times 1\frac{2}{3} = 96\text{c.in.}, \text{Ans.}$

(ART. 399, p. 305.)

1. $5 \times 5 = 25$, lower base ;
 $3 \times 3 = 9$, upper base ;
 $\sqrt{25 \times 9} = 15$, mean between the bases ;
 $49 \times 7 = 343$ cu.ft., Ans.
2. $3.141592 \times 3^2 = 28.274328$, upper base ;
 $3.141592 \times 2^2 = 12.566368$, lower base ;
 $\sqrt{28.274328 \times 12.566368} = 18.849552$, mean bt'n bases ;
 $59.690248 \times 4 =$
 238.760992 cu.ft., Ans.

(ART. 401, p. 306.)

1. $3.141592 \times 100 = 314.1592$, circumference ;
 $314.1592 \times 100 = 31415.92$ sq.in., Ans.
2. $3.141592 \times 8000 = 25132.736$, circumference ;
 $25132.736 \times 8000 = 201061888$ sq.m., Ans.
3. $3.141592 \times 885680 = 2782445.20256$, circumference ;
 $2782445.20256 \times 885680 = 2464356067003.3408$ sq.m.
 Ans.

(ART. 402, p. 306.)

1. $.523598\frac{2}{3} \times 100^3 = 523598\frac{2}{3}$ c.in., Ans.
2. $3.141592 \times 8000 = 25132.736$, circumference ;
 $25132.736 \times 8000 = 201061888$, surface ;
 $201061888 \times \frac{885680}{2 \times 3} = 268082517333\frac{1}{3}$ c.m., Ans.
3. (See Art. 401, Ex. 3.) 2464356067003.3408 , surface ;
 $2464356067003.3408 \times \frac{885680}{2 \times 3} = 363771813570586479.9573\frac{1}{3}$
 c.m., Ans.

MISCELLANEOUS EXAMPLES, (page 307.)

1. $\frac{3}{4} + \frac{1}{4} = \frac{4}{4}$; if 20 is $\frac{4}{3}$, 5 is $\frac{1}{3}$ and $\frac{3}{3} = 3$ times 5 = 15,
Ans.
2. $21 + 4\frac{2}{3} = 25\frac{2}{3}$, Ans.
3. The 1st number is 1 time the 1st;
The 2d number is $3\frac{1}{2}$ times the 1st;
 $\therefore 54$ is $\frac{4\frac{1}{2}}{3\frac{1}{2}}$ times the 1st;
and $54 \div 4\frac{1}{2} = 12$, 1st }
 $12 \times 3\frac{1}{2} = 42$, 2d } Ans.
4. 3r. 10rd. = 130rd.; 1a. = 160rd.; $\therefore$ 3r. 10rd. = $1\frac{30}{160}$
= $1\frac{3}{8}$ a., Ans.
5. $12\frac{1}{2} + 37\frac{1}{2} = 50$, Ans.
6. $1000 \div 33\frac{1}{3} = 30$, Ans.
7. $64 \times 37\frac{1}{2} = 2400$, Ans.
8. $144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$
 $84 = 2 \times 2 \times 3 \times 7$
 $2 \times 2 \times 3 = 12$, Ans.
9. $364 = 2 \times 2 \times 7 \times 13$
 $72 = 2 \times 2 \times 2 \times 3 \times 3$
 $2 \times 2 \times 2 \times 3 \times 3 \times 7 \times 13 = 6552$, Ans.
10. $\$756.64 \times .042\frac{1}{2} = \$32.409$, Ans.
11. $10 + 25 = 35$, larger number, 1st Ans.; $10 + 35$, sum,
2d Ans.
12. $3642538 - 563492 = 3079046$, 1st Ans.
 $3642538 + 3079046 = 6721584$, 2d Ans.
13. $20 \times 16 \times 2\frac{1}{2} = 800$ cu.ft. = 1382400c.in., solid con-
tents of wall;
 $8 \times 4 \times 2 = 64$ in., solid contents of 1 brick;
 $1382400 \div 64 = 21600$, Ans.

14. $(40 + 25) \times 2 = 130$, length of 4 walls;
 $130 \times 22 \times 1\frac{1}{2} = 4290$, No. of cubic feet;
 $4290 \times 27 = 115830$, Ans.

NOTE. — The number of bricks in a cubic foot is 27. This may be found by dividing the number of inches in a foot, 1728, by the number of inches in a brick, $8 \times 4 \times 2 = 64$; thus, $1728 \div 64 = 27$.

15. $365 \times 4 + 1 = 1461$, No. of days in 4 years;
 $\$50000 \times 4 = \$200000$, salary for 4 years;
 $\$200000 - \$141560 = \$58440$, sum spent.
 $\$58440 \div 1461 = \$40$, Ans.
16. The number multiplied by *half* itself gives $12\frac{1}{2}$, $\therefore$ the number multiplied by *itself* gives 2 times $12\frac{1}{2} = 25$; but a number multiplied by *itself* gives the *square* of the number. Hence, $\sqrt{25} = 5$, Ans.
17. If the number multiplied by *three-fourths* of itself gives 27, then the number multiplied by *itself* gives $\frac{4}{3}$ times $27 = 36$; $\therefore$ 36 is the *square* of the number, and $\therefore$ the number is $\sqrt{36} = 6$, Ans.
18. $20 \times 16 = 320$ sq.ft., Ans.
19. $\sqrt{676} = 26$ ft., Ans.
20. $5280 \times 20\frac{1}{2} = 108240$, No. feet in $20\frac{1}{2}$ miles;
 $108240 \div 9 = 12026\frac{2}{3}$, fore wheel, }
 $108240 \div 10.5 = 10308\frac{4}{5}$, hind wheel, } Ans.
21. If the rectangle ABCD has its length to its breadth as 3 to 2, and contains 60 acres, and if $\frac{1}{3}$ of it is cut off by the line EF, there will remain a square AEFD, containing 40 acres = 6400 sq. rd.;
-
- $\therefore AD = \sqrt{6400} = 80$ rd., width, }
and $2:3::AD=80$ rd.: $AB=120$ rd., length, } Ans.
22. $\$28 + \$4.25 = \$32.25$, sum to be received;
 $84 - 9 = 75$, No. gal. remaining;
 $\$32.25 \div 75 = 43$ c., Ans.

23. $4^2 : 6^2 :: 4h. : 9h.,$ Ans. (Art. 362.)

24. 12gal. 3qt. 1pt. 2gi.

$$\begin{array}{r} 4 \\ 51 \text{qt.} \\ 2 \\ 103 \text{pt.} \\ 4 \\ 414 \text{gi. Ans.} \end{array}$$

25. 60)1846542sec.

60)30775m. 42sec.

24)512h. 55m.

7)21d. 8h.

3wk.

Ans. 3wk. 8h. 55m. 42sec.

26. 2)25740

2)12870

3)6435

3)2145

5)715

11)143

13

Ans. 2, 2, 3, 3, 5, 11, 13.

29. $\frac{7}{12}\text{£} = 3^5\text{s.} = 11\frac{2}{3}\text{s.}; \frac{2}{3}\text{s.} = 8\text{d.}$

Ans. 11s. 8d.

30. $\frac{2}{5}\text{oz.} = \frac{1}{30}\text{lb.}; \frac{1}{8}\text{dwt.} = \frac{1}{160}\text{oz.} = \frac{1}{1920}\text{lb.}; \frac{3}{8}\text{gr.} = \frac{1}{64}\text{dwt.}$

$= \frac{1}{1280}\text{oz.} = \frac{1}{15360}\text{lb.}; \frac{3}{8}\text{lb.} + \frac{1}{30}\text{lb.} + \frac{1}{1920}\text{lb.}$

$+ \frac{1}{15360}\text{lb.} = \frac{6281}{15360}\text{lb.} = \frac{6281}{1280}\text{oz.} = \frac{6281}{64}\text{dwt.} =$

$188\frac{1}{2}\text{gr., Ans.}$

31. $\frac{1}{5}\text{oz.} = \frac{1}{60}\text{lb.}; \frac{3}{4}\text{lb.} - \frac{1}{60}\text{lb.} = \frac{17}{20}\text{lb.} = \frac{17^3}{35} = 43\frac{3}{5}\text{oz., Ans.}$

32. $(31 + 20 - 1) \div 2 = 25$, number of men in one side of the 1st square; $25^2 + 31 = 656$, Ans.

EXPLANATION. — The 31 men left by the first arrangement and the 20 men required to complete the second arrangement together constitute one line of men on each of two sides of the second square; then taking out the corner man, and dividing the remainder, 50, by 2, the quotient, 25, is the number of men in each side of the first square; therefore the square of 25 plus the 31 men remaining constitute the army. So, if there were 25 men in one side of the first

square, there would manifestly be 26 men in one side of the second square, and $\therefore$ the square of 26 *minus* the 20 men wanting constitute the army; i. e.

$$26^2 - 20 = 656, \text{ Ans., as before.}$$

$$33. \quad 80\text{c., cost.} \quad 80\text{c.} + 20\text{c.} = \$1.00, \text{ selling price.}$$

$$\begin{array}{l} .25, \text{ gain.} \quad \frac{100}{66\frac{2}{3}} \times \$1 = \$1.50, \text{ marked price, Ans.} \\ 20.00\text{c.} \end{array}$$

$$34. \quad 6 \times 6 = 36\text{sq.m.} = 144521625600\text{sq.in.};$$

$$144521625600 \times 2 = 289043251200, \text{ No. c.in. of water;}$$

$$289043251200 \div 231 = 1251269485\frac{5}{7}\frac{1}{2}\text{gal., Ans.}$$

$$35. \quad (32 + 22) \times 2 = 108\text{ft., distance round the house;}$$

$$108 \times 20 \times 1\frac{1}{2} = 2880\text{cu.ft., solid contents of walls;}$$

$$8 \times 4 \times 1\frac{1}{2} \times 2 = 85\frac{1}{2}\text{cu.ft., deduct for doors;}$$

$$6 \times 3 \times 1\frac{1}{2} \times 21 = 504\text{cu.ft., deduct for windows;}$$

$$\quad \quad \quad 589\frac{1}{2}\text{cu.ft., deduct for doors and}$$

windows;

$$2880 - 589\frac{1}{2} = 2290\frac{1}{2}; 2290\frac{1}{2} \times 27 = 61848, \text{ Ans.}$$

$$36. \quad \sqrt{\sqrt{16} \times \sqrt{81}} = \sqrt{4 \times 9} = \sqrt{36} = 6, \text{ Ans.}$$

$$37. \quad \frac{22\frac{1}{2} \times 6}{6\frac{1}{2}} = \frac{45 \times 6 \times 4}{2 \times 25} = \frac{108}{5} = 21\frac{3}{5}\text{h., Ans.}$$

$$38. \quad 192000\text{m.} = 1013760000\text{ft.};$$

$$1013760000 : 1142 = 887705\frac{4}{5}\frac{4}{7} : 1; 887705\frac{4}{5}\frac{4}{7}, \text{ Ans.}$$

$$39. \quad \sqrt{4 \times 8^2} = 2 \times 8 = 16, \text{ Ans.}$$

$$40. \quad (\sqrt{25})^3 = 5^3 = 125, \text{ Ans.}$$

$$41. \quad {}^3\sqrt{8^2} = {}^3\sqrt{64} = 4, \text{ Ans.}$$

$$42. \quad ({}^3\sqrt{8})^2 = 2^2 = 4, \text{ Ans.}$$

$$46. \quad \text{One ship sails 10 times 6 miles} = 60\text{m. and the other}$$

$$10 \text{ times 8 miles} = 80\text{m.};$$

$$\therefore \sqrt{60^2 + 80^2} = \sqrt{10000} = 100\text{m., Ans.}$$

NOTE. — This example may be solved by finding how far apart the ships are in one hour, and then multiplying this distance by 10.

44. $\sqrt{59049} = 243$, Ans.

45. The areas of the two ponds are to each other in the ratio
 $1 : 36$; $\therefore 1 : 36 :: 20^2 : \text{square of required diameter}$;
 and evolving, $1 : 6 :: 20 : 120\text{rd.}$, required
 diameter, Ans.

46. $16 \times 64 = 1024$; $\sqrt{1024} = 32$, Ans.

47. $30^2 \div 3 = 300$, Ans.

48. $\sqrt{41^2 - 40^2} = \sqrt{81} = 9\text{ft.}$, distance to one side;
 $\sqrt{41^2 - 9^2} = \sqrt{1600} = 40\text{ft.}$, distance to other side;
 $\therefore$ width of street $= 49\text{ft.}$, Ans.

49. 40a. $= 6400\text{sq.rd.}$; $6400 \div .785398 = 8148.734782$;
 $\sqrt{8148.734782} = 90.27$, diameter. (Art. 361.);
 $90.27 \times 3.141592 = 283.5915\text{rd.}$, circumference;
 $\sqrt{6400} = 80\text{rd.}$, 1 side of a square 40-acre lot;
 $80 \times 4 = 320\text{rd.}$, 4 sides of a square 40-acre lot;
 $320 - 283.5915 = 36.408\text{rd.}$, difference of fence;
 50c. $\times 36.408 = \$18.204$, Ans.

	1862.	Dr.	Int.
50.	0m. Jan. 18, 6m.	\$300	\$9.90
	2m. Mar. 12, 3m.	200	5.40
	4m. June 15, 4m.	400	19.00
		<u>\$900</u>	<u>\$34.30</u>
		Cr.	
	1m. Feb. 18, 4m.	\$180	\$5.04
	4m. May 24, 6m.	120	6.48
	6m. July 6, 5m.	300	16.80
	6m. " 24, 4m.	100	5.40
		<u>\$700</u>	<u>\$33.72</u>
		\$900	\$34.30
		\$700	\$33.72
		<u>\$200</u>	<u>\$0.58</u>
		2)100)	
			1).58

$.58\text{m.} = 17\text{d.}$

17d. from Jan. 1, reckoned forward, gives Jan. 17, 1862,
 Ans.

51. $81 \times 49 = 3969$ sq.rd.; $\sqrt{3969} = 63$ rd., Ans.
52. $\$25000 \times .02 = \$500$, commission on sale;
 $\$25000 - \$500 = \$24500$, sum left in agent's hands
 after taking pay for selling the goods.
 Now, as he is to have 1 per cent. on this sum, the
 $\$24500$ is $\frac{1}{101}$ of the sum invested; $\therefore$
 $\$24500 \div 1.01 = \$24257.425$, Ans.
- 53. $\$8000 \times \frac{3}{4} = \$6000$; $\$6000 \times .00\frac{1}{2} = \$36$, Ans.
54. $\$1.191016$, Amount of \$1 for 3yr.
 $.042$, Int. of \$1 for 8m. 12d.
 $\begin{array}{r} 2382032 \\ 4764064 \\ \hline \$0.050022672 \\ \$1.191016 \\ \hline \$1.241039, \text{ Amount of } \$1 \text{ for 3yr. 8m. 12d.} \end{array}$
 $\begin{array}{r} 325 \\ 6205195 \\ 2482078 \\ \hline 3723117 \\ \hline \$403.337675, \text{ Amount of } \$325 \text{ for 3yr. 8m. 12d., Ans.} \end{array}$
55. \$1200. Principal.
 $\begin{array}{r} 19.20 \text{ Int. from May 12, '60, to Aug. 18, '60; 3m. 6d.} \\ \hline 1219.20 \text{ Amount of Principal to Aug. 18, 1860.} \\ 300 \text{ 1st Payment.} \\ \hline 919.20 \text{ 1st Remainder, forming 2d Principal.} \\ 46.879 \text{ Int. from Aug. 18, '60, to June 24, '61; 10m. 6d.} \\ \hline 966.079 \text{ Amount of 2d Principal to June 24, 1861.} \\ 426.50 \text{ Sum of 2d, 3d, and 4th Payments.} \\ \hline 539.579 \text{ 2d Remainder, forming 3d Principal.} \\ 16.187 \text{ Int. from June 24, '61, to Dec. 24, '61; 6m.} \\ \hline 555.766 \text{ Amount of 3d Principal to Dec. 24, 1861.} \\ 100. \text{ 5th Payment.} \\ \hline 455.766 \text{ 3d Remainder, forming 4th Principal. [18d.} \\ 8.204 \text{ Int. from Dec. 24, '61, to Apr. 12, '62; 3m.} \\ \hline \$463.97 \text{ Amount due Apr. 12, 1862, Ans.} \end{array}$

56. A bushel equals 8 half pecks ;
 $\sqrt[3]{8} = 2$; $18\frac{1}{2} \div 2 = 9\frac{1}{4}$ in., diameter, } Ans.
 $8 \div 2 = 4$ in., depth,
57. $\frac{1}{3}\frac{3}{8} = \frac{1}{8}$; $\frac{1}{8} \times 125 = 150$; $150 - 100 = 50 =$ gain per cent., Ans.
58. $5\text{rd.} \times 1\frac{1}{2} = 8\text{rd.}$, length of garden ;
 $8\text{rd.} = 132\text{ft.}$; $5\text{rd.} = 82\frac{1}{2}\text{ft.}$;
 $(139 + 82\frac{1}{2}) \times 2 = 443\text{ft.}$, length of wall ;
 $443 \times 4 \times 3\frac{1}{2} = 6202\text{cu.ft.}$, solid contents of wall ;
 $3\frac{1}{2}\text{c.} \times 6202 = \$201.56\frac{1}{2}$, Ans.
59. $(132 + 75\frac{1}{2}) \times 2 = 415\text{ft.}$, length of ditch ;
 $415 \times 3\frac{1}{2} \times 2\frac{1}{2} = 3994\frac{3}{8}\text{cu.ft.}$, solid contents of ditch ;
 $\frac{3}{8}\text{c.} \times 3994\frac{3}{8} = \$24.96\frac{3}{4}$, Ans.
60. $(135\frac{1}{2} + 79) \times 2 = 429\text{ft.}$, length of wall ;
 $429 \times 3\frac{1}{2} \times 3\frac{1}{2} = 5630\frac{3}{8}\text{cu.ft.}$, solid contents of wall ;
 $6\frac{3}{8}\text{c.} \times 5630\frac{3}{8} = \$365.99\frac{1}{8}$, Ans.
61. The hound gains 3 rods while the hare runs 9 ; $\therefore$ as he must gain 15 times 3 rods, the hare will run 15 times 9 = 135 rods, Ans.
62. The hound gains 4 rods in running 20 ; $\therefore$ as he must gain 8 times 4 rods, he must run 8 times 20 = 160 rods, Ans.
63.

yr.	m.	d.
1862	7	20
1861	8	8
	11	12

 $\$72.50 \times .057 = \$4.133$, Ans.
64. A can do $\frac{1}{10}$ of the work in 1 day ; B can do $\frac{1}{12}$ in 1 day ; C can do $\frac{1}{15}$ of it in 1 day ; $\therefore$ A, B, and C can do $\frac{1}{10} + \frac{1}{12} + \frac{1}{15} = \frac{1}{5}$ of it in 1 day. Hence $\frac{1}{\frac{1}{5}} = 5$, No. of days, Ans.
65. $\frac{1}{2} - \frac{1}{3} = \frac{1}{6}$; $\frac{1}{6} \times \frac{1}{12} = \frac{1}{72}$; $\frac{1}{2} + \frac{1}{72} = \frac{37}{72}$; $\frac{1}{6} - \frac{1}{72} = \frac{11}{72}$; $\therefore \$1400 = \frac{1}{72}$, and $\$200 = \frac{1}{72}$, and $\frac{1}{6} = \$3200$, Ans.
66. $2\text{lb.} \times 45 = 90\text{lb.}$; $90\text{lb.} \div 60 = 1\frac{1}{2}\text{lb.}$, Ans.

67. If \$60 is $\frac{7}{8}$, then $\frac{1}{8}$ is $\frac{1}{8}$ of \$60 = \$12, and $\frac{7}{8}$ are 2 times \$12 = \$24, Ans.; for, if the watch was sold for $\frac{7}{8}$ of the cost, the remaining $\frac{1}{8}$ were lost.

$$68. \left. \begin{array}{l} 18\text{in.} : 15\text{in.} \\ 4\text{in.} : 8\text{in.} \\ 2\text{in.} : 1\text{in.} \\ 10 : 19 \\ 2 : 33 \end{array} \right\} :: \$1240 : \$32395, \text{ Ans.}$$

A's stock.	B's stock.
69. \$2000 $\times$ 4 = \$8000	\$2000 $\times$ 5 = \$10000
3000 $\times$ 5 = 15000	3500 $\times$ 4 = 14000
2500 $\times$ 3 = 7500	4500 $\times$ 3 = 13500
<u>\$30500</u>	<u>\$37500</u>

$$\begin{array}{r} \text{C's stock.} \\ \$2000 \times 5 = \$10000 \\ 1500 \times 4 = 6000 \\ 2500 \times 3 = 7500 \\ \hline \$23500 \end{array}$$

\$30500 + \$37500 + \$23500 = \$91500, sum of products;

$$\left. \begin{array}{l} \frac{3}{8}\frac{1}{2} \text{ of } \$3000 = \$1000, \text{ A's share,} \\ \frac{3}{8}\frac{1}{2} \text{ of } \$3000 = \$1229.50\frac{5}{8}, \text{ B's share,} \\ \frac{3}{8}\frac{1}{2} \text{ of } \$3000 = \$770.49\frac{1}{8}, \text{ C's share,} \end{array} \right\} \text{ Ans.}$$

70. Assume

gal.	s.	s.	
	8 at 6,	gain 48	} = $\frac{s.}{54}$, gain.
12s.	3 at 10,	gain 6	
	1 at 15,	loss 3	} = $\frac{s.}{54}$, loss
	6 at 20,	loss 48	
Add	1 at 15,	loss 3	
	<u>19, sum of proportional parts.</u>		

gal.	gal.	gal.	gal.	
19 : 95 :: 8 : 40 at 6s.				} Ans.
19 : 95 :: 3 : 15 at 10s.				
19 : 95 :: 2 : 10 at 15s.				
19 : 95 :: 6 : 30 at 20s.				

$$71. \quad 17^{\circ} \quad 20' \quad 40''$$

4

$$1\text{h.} \quad 9\text{m.} \quad 22\frac{2}{3}\text{sec.}, \text{Ans.}^{\circ} \text{ (Art. 208.)}$$

$$72. \quad 3\text{h.} \quad 18\text{m.} \quad 15\text{sec.} = 198\text{m.} \quad 15\text{sec.};$$

$$4)198\text{m.} \quad 15\text{sec.}$$

$$49^{\circ} \quad 33' \quad 45'', \text{Ans.} \text{ (Art. 212.)}$$

$$73. \quad 129\frac{1}{2} = 129\frac{1}{2}; \$\frac{1}{4} - \$\frac{7}{5} = \$\frac{6}{35}, \text{gain per yard.}$$

$$\frac{200 \times 35 \times 27}{6 \times 3500} = 9, \text{No. bales, Ans.}$$

EXPLANATION. — Dividing the total gain, \$200, by the gain per yd., $\$ \frac{6}{35}$, gives the No. of yards; then dividing the No. of yards by the No. of yards in a bale, $2\frac{1}{2}$, gives the No. of bales.

$$74. \quad 1640\text{m.} \times 1\frac{1}{2} = 2500\text{m.}, \text{length of cable.}$$

$$\frac{2500\text{m.} \times 21 \times 25 \times 7 \times 18}{20 \times 24} = 344531\frac{1}{4}\text{m.}, \left\{ \begin{array}{l} \text{length of} \\ \text{iron wire.} \end{array} \right.$$

$$2500\text{m.} \times 7 = 17500 \text{ m.}, \left\{ \begin{array}{l} \text{length of} \\ \text{copper wire.} \end{array} \right.$$

$$362031\frac{1}{4}\text{m.}, \text{Ans.}$$

THE METRIC SYSTEM.

LONG MEASURE.

(ART. 405, p. 315.)

2. $25700 \div 1000 = 25.7^{\text{kilom.}}$
3. $18.7 \times 1000000 = 18700000^{\text{mm.}}$
4. $2750 \div 1000 = 2.75^{\text{m.}}$

(ART. 405, p. 315.)

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. 7.25 14.056 1.85 1.6 <li style="border-top: 1px solid black;">24.756^{m.} | <ol style="list-style-type: none"> 2. 7000. 1750. <li style="border-top: 1px solid black;">8750. 3256.521 <li style="border-top: 1px solid black;">5493.479^{m.} |
|--|---|

SQUARE MEASURE.

(ART. 407, p. 316.)

1. $327000 \div 10000 = 32.7^{\text{ha.}}$
2. $2.54 \times 1000000 = 2540000^{\text{centa.}}$
3. $150 \times 100 = 15000^{\text{sq.m.}}$
4. $200 \times 56 = 11200^{\text{sq.m.}} = 112^{\text{ar.}}$
5. $6.8 \times 4.5 = 30.6^{\text{sq.m.}}$
6. $30.6 \div 0.6 = 51^{\text{m.}}$

CUBIC MEASURE.

(ART. 408, p. 316.)

1. $12.87 \times 1000000 = 12870000^{\text{cu.centim.}}$
 2. $32500 \div 1000 = 32.5^{\text{ft.}}$
 3. $1.25 \times 1.13 \times 0.8 = 1.13^{\text{cu.m.}}$
 4. $2.13 \times 2.13 = 4.5369^{\text{sq.m.}}$; $6 \div 4.5369 = 1.3224^{\text{+m.}}$
 5. $25. \times 3.4 \times .268 = 22.78^{\text{cu.m.}}$
-

DRY AND LIQUID MEASURE.

(ART. 409, p. 317.)

1. $17 \times 1000 = 17000^{\text{b.}}$
 2. $17500 \div 100 = 175^{\text{hl.}}$
 3. $17.3 \times 4.38 = \$7.5774.$
 5. $3 \times 2 \times 1.5 = 9^{\text{cu.m.}} = 90^{\text{hl.}}$
 6. $12 \times 8 = 96^{\text{sq.m.}}$; $2500^{\text{hl.}} = 250^{\text{cu.m.}}$; $250 \div 96 = 2.604^{\text{+m.}}$
-

WEIGHT.

(ART. 410, p. 318.)

1. $2.75^{\text{t.}} \times 1000000 = 2750000^{\text{gr.}}$
2. $381^{\text{gr.}} \times 1000 = 381000^{\text{mgr.}}$
3. $17520^{\text{gr.}} \div 1000 = 17.52^{\text{kilos.}}$
4. $27 \times 100 = 2700^{\text{kgr.}}$
5. $1.75 \times 1.3 \times 0.8 = 1.82^{\text{cu.in.}} = 1820^{\text{b.}}$ $\therefore$ the water weighs $1820^{\text{kgr.}}$

WEIGHT OF BODIES.

(ART. 412, p. 319.)

2. $1.6 \times 0.75 \times 0.4 = 0.48^t$; $0.48 \times 2.7 = 1.296^t$
4. $30 \times 0.2 \times 0.2 \times 7.8 = 9.36^{\text{kilos.}}$
5. $40 \times 3 \times 2.5 \times 0.8 = 240^{\text{kilos.}}$
6. $32.5 \times 20 \times 0.03 \times 11.4 \times 0.30 = \$66.69.$

(ART. 416, p. 323.)

2. $312 \times 39.37 = 12283.44^{\text{in.}}$
3. $12000 \times 2.2046 = 26455.2^{\text{lb.}}$
4. $1.0567 \times 1000 = 1056.7^{\text{qt.}}$

(ART. 417, p. 323.)

3. $15 \div .26417 = 56.781\frac{1}{2} \therefore$ the water weighs $56.781\frac{1}{2}^{\text{kilos.}}$
4. $7\text{ft. } 3\text{in.} = 87\text{in.}$; $3\text{ft. } 10\text{in.} = 46\text{in.}$; $2\text{ft. } 2\text{in.} = 26\text{in.}$
 $87 \times 46 \times 26 = 104052^{\text{cu.in.}}$
 $104052 \div 6102.2 = 17.051\frac{1}{2}^{\text{hl.}}$

MISCELLANEOUS EXAMPLES.

- | | |
|---|--|
| 1. $12 \times 1000 = 12000^{\text{kilom.}}$ | |
| 2. $1256.7 \div 100 = 12.567^{\text{quint.}}$ | |
| 3. $\begin{array}{r} 125 \\ 17060 \\ 71 \\ 3 \\ \hline 17259^{\text{m.}} \end{array}$ | 4. $\begin{array}{r} 25060. \\ 18.315 \\ 16.05 \\ 700. \\ \hline 25794.365^{\text{kg.}} \end{array}$ |
| 5. $\begin{array}{r} 2000. \\ 1862.15 \\ \hline 137.85^{\text{lb.}} \end{array}$ | 6. $\begin{array}{r} 91000. \\ 28031. \\ \hline 62969^{\text{lb.}} \end{array}$ |

7. $17.28 \times 312500 = 5400000\text{gr.} = 5400\text{kilos.}$
8. $51.2 \times 687500 = 35200000\text{mm.} = 35.2\text{kilom.}$
9. $120\text{km.} = 120000\text{m.}; 120000 \div 15 = 8000.$
10. $12.04^{\text{t}} = 12040000\text{gr.}; 12040000 \div 17200 = 700\text{gr.}$
11. $2700^{\text{hl}} = 270000^{\text{l}}; 270000 \div 90 = 3000.$
12. $32\text{km.} = 32000\text{m.}; 32000 \div 47621 = 0.67197\text{+m.}$
13. 264.17gal.
14. $1725 \times 15.432 = 26620.2\text{grains.}$

$$\begin{array}{r} 20 \overline{) 26620.2} \\ \underline{3) 1331} \quad + 0.2\text{grains.} \\ \underline{8) 443} \quad + 2^{\text{sc.}} \\ \underline{12) 55} \quad + 3^{\text{dr.}} \\ \cdot \quad 4 \quad + 7^{\text{oz.}} \end{array}$$

 $4\text{lb. } 7\text{oz. } 3^{\text{dr.}} 2^{\text{sc.}} 0.2\text{grains.}$
15. $1 \div 0.0002471 = 4046.944\text{+sq.m.}$
16. $5^{\text{bu.}} = 160^{\text{qts.}}; 160 \div 0.908 = 176.211\text{+}^{\text{l.}}$
17. Cu. decim. of metal weighs 10000^{gr.}; $10000 \div 5 = 2000.$
18. $4 \times 0.4 = 1.6\text{sq.m.} = 160\text{sq.decim.}$
19. $\sqrt{1296} = 36^{\text{decim.}} = 3.6^{\text{m.}}$
20. $80^{\text{hl.}} = 8^{\text{cu.m.}} \quad \sqrt[3]{8} = 2^{\text{m.}}$
21. $1331^{\text{kilos.}}$ water are contained in $1331^{\text{cu.decim.}}; \sqrt[3]{1331} = 11^{\text{decim.}} = 11^{\text{m.}}$
22. $1.5^2 \times 3.141592 = 7.068\text{+}^{\text{ha.}}$
23. $0.5^3 \times 3.141592 \times 0.02 \times 7.2 \times 45 = \$5.089\text{+}.$
24. $150 \times 3.141592 \times 150 = 70685\text{+sq.mm.} = 7.0685\text{+sq.decim.}$
25. $12^3 \times .523599 \times 7.2 = 6514\text{+}^{\text{r.}} = 6.514\text{+kilos.}$
26. $1.25 \times .72 \times 0.4 = .36^{\text{cu.m.}}; 1 \div .36 = 2.777\text{+}.$

27. $8.5 \times 2.2046 = 18.7391^{\text{cts.}}$ = cost price per kilo. 22
 $- 18.7391 = 3.2609$ = total gain per kilo.
 $18.7391 : 3.2609 :: 100 : 17.40+$ = gain per cent.
28. $1^{\text{L}} = 1.0567^{\text{qts.}}$; Cost price = \$1 per $1.0567^{\text{qts.}}$; $1 \div 1.0567 = \$0.946+$ = cost price per quart. $1 - 0.946 = \$0.054$, total gain per quart. $.946 : .054 :: 100 : 5.70+$ = gain per cent.
29. $2240 : 2204.6 = 5 : \$4.92+$ = cost price per tonneau.
 $100 : 118 :: 4.92 : \$5.80+$ = selling price per tonneau.
30. $42^\circ - 30^\circ = 12^\circ$. 90° ($\frac{1}{4}$ circumference of earth) = $10000^{\text{kilom.}}$; $90 : 1000 :: 12 : 1333.3+$ $^{\text{kilom.}}$.

GOVERNMENT SECURITIES.

MISCELLANEOUS EXAMPLES.

- $\$4000 \times 1.15\frac{1}{2} = 4620$, Ans.
- $\$12000 \times .03 = \$360$ (gold) $\times 1.32 = \$475.20$, Ans.
- $\$4445 \div 116\frac{2}{3} = \$3810$, Ans.
- Int. in gold is \$3 semi-annually. $\therefore$ Int. in currency is
 $\$3\frac{3}{4} \cdot \frac{3\frac{3}{4}}{108\frac{1}{3}} = 1\frac{45}{13} = 3\frac{6}{13}\%$ semi-annually, Ans.
- By Proportion, $284 : 100 = \$1.00 : 35\frac{1}{4}$ cents.
- Bond costs, say \$100 in gold, = \$120 currency.
do. earns \$6 " " = \$7.20 "
which is 6%.
- R. R. stock, costs \$150.
" " earns \$10, which is $6\frac{2}{3}\%$.
- $\$1000 \times 1.15\frac{1}{2} = \$1156.25$, Ans.
- $\$600 \div .05 = \$12000 \times 1.09 = \$13080$ in currency,
Ans.
- $\$1000 \times 1.15 = \$1150$; $\$10000 \div 1150 = 8$ bonds, .
and \$800 remaining, Ans.

10. \$6 in gold = $5\frac{1}{2}\%$ of the investment; $\$6 \div .055 = 109\frac{1}{11}$, Ans.
11. \$80 earns \$4 per annum; therefore \$1 earns \$.05 per annum. Ans. 5% gold.
12. $4 \times 1000 = 4000$; $119\frac{3}{4}\% + \frac{1}{4}\% = 120\%$ on par value, $\$4000 \times 120\% = \$4800$, Ans.
13. $\$750 \times 2 = \$1500 \times 1.12\frac{1}{2} = \$1687.50 \div \$25000 = 6\frac{7}{8}\%$, Ans.
14. Suppose, as is necessary, the rate of premium to remain unchanged during the twenty years, and that the bond is not sold at any time short of the full date of payment. Suppose, also, the interest to be paid annually. Mortgage, say \$120, amounts, at compound interest, in 20 years, at 6%, to \$384.85, total income from Mortgage.

Bond of \$100, which will cost \$120 in currency, earns \$6 in gold, or \$7 annually in currency. Suppose this yearly interest to be invested as it accrues, and we have an annuity forborne, or left unpaid, for twenty years. This annuity, if calculated by Geometrical Progression, and at six per cent., will give \$257.50, as follows: $\$1.06^{(19)} = \$3.025585 \times 7 = \$21.179095 \times 1.06 = \$22.4498 - 7 = 15.4498 \div .06 = \$257.49734$.

Bond paid in currency,	\$100.
Amounts of annual payments,	257.50
Total income from bond,	\$357.50
“ “ “ mortgage,	384.85
Balance in favor of mortgage,	\$27.35
\$27.35 on \$120, is \$.228 on \$1.	

Ans. The mortgage is the better investment by $.01\frac{7}{8}\%$, very nearly.







